Section: Radiology

Original Research Article

SPECTRUM OF INCIDENTAL RARE OCCULT CONGENITAL LESIONS OF GASTROINTESTINAL SYSTEM ON ROUTINE IMAGING STUDY OF WHOLE ABDOMEN

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ABSTRACT

Background: This study aims to characterize the diagnostic features of occult lesions of the bowel found incidentally during routine evaluation of the whole abdomen using multi-imaging techniques, and to critically discuss the clinical correlation of these variants with underlying pathology.

Materials and Methods: A review of radiological records, including computed tomography (CT) and ultrasound, was conducted for patients presenting with mild to severe abdominal complaints.

Results: Several bowel lesions were identified, including gastric, small bowel, large bowel lesions, and a few miscellaneous findings. The identification of typical aberrant locations by radiologic imaging studies played a crucial role in diagnosing these lesions accurately.

Conclusion: The study emphasizes the importance of utilizing multi-imaging techniques to characterize rare occult lesions, distinguishing between normal and abnormal findings, and preventing misdiagnosis. Its importance in timely interventions is based on accurate imaging interpretation and thus leading to good patient outcomes.

Keywords: Occult lesions, Multi-imaging techniques, computed tomography, ultrasound, gastrointestinal abnormalities.

INTRODUCTION

The gastrointestinal system is a highly complex organ system, both in structure and function. It is derived from the embryonic endoderm during gastrulation, with distinct foregut, midgut, and hindgut regions becoming identifiable by the end of the fourth week of gestation. By the eighth week, the gut undergoes significant changes, and although initially obliterated, it regains a patent lumen, ensuring the formation of a functional gastrointestinal tract. The intricate processes of gastrointestinal tract development, however, are susceptible to disruption due to various genetic, environmental, or physiological factors. This results in congenital anomalies that may present with varied manifestations, some of which remain occult, causing significant diagnostic challenges. Rare occult congenital lesions of the gastrointestinal system are often clinically silent or asymptomatic, yet their presence can sometimes lead to serious complications when they become symptomatic. These anomalies can be particularly difficult to identify, as they often lack distinct clinical features, or they may present in such a way that they are easily mistaken for more common gastrointestinal diseases.[1]

Congenital anomalies of the gastrointestinal tract, although uncommon, are critical to identify as they can result in substantial morbidity. These anomalies are not limited to infants but also present challenges in pediatric and adult populations. Studies have shown that congenital anomalies of the gastrointestinal system are a frequent cause of diagnostic difficulty, leading to misdiagnosis and inadequate management due to their varied clinical presentations. Radiological imaging plays a crucial role in detecting these abnormalities, as it provides a non-invasive means of characterizing and diagnosing gastrointestinal lesions. In particular, modalities like computed tomography (CT) and ultrasound have revolutionized the ability to identify such conditions,

particularly when clinical signs are vague or non-specific. The findings indicate that the skills of radiologist substantially influences the effectiveness of imaging techniques, underscoring a need for ongoing education and standardized training protocols to enhance diagnostic competency. Moreover, this study highlights the necessity for integrating collaborative imaging techniques and suggests advanced artificial intelligence tools in imaging analysis to eliminate errors.

The spectrum of congenital gastrointestinal anomalies encompasses a wide range of lesions, including both the stomach and the small and large intestines. These lesions can be categorized as either obvious or occult. Occult lesions, by definition, are those that remain clinically undetected or present subtle symptoms that may not be easily attributed to the underlying pathology. The small bowel, in particular, is susceptible to congenital anomalies such as malrotation, anatomic variations, and abnormal positioning, all of which can result in various levels of symptomatology.[2] These anomalies often manifest in adulthood only when complications such as bowel obstruction or volvulus occur. Similarly, anomalies of the large bowel, such as redundant colon or atypical positioning, may present with nonspecific gastrointestinal complaints, which often leads to diagnostic confusion. These rare anomalies, while generally asymptomatic, have the potential to become symptomatic under certain conditions, such as during physical trauma or when the bowel becomes obstructed.[3]

The challenge in diagnosing rare gastrointestinal anomalies lies not only in the rarity of these conditions but also in their tendency to present in atypical locations. For instance, the gastric fundus, which is usually located in the left subdiaphragmatic region, can sometimes be found posterior to the spleen or in other aberrant locations. While these variations are often clinically silent, they may increase the risk for certain complications, such as gastric volvulus or obstruction. Likewise, the colon may appear in unusual anatomical positions, such as the splenic or hepatic flexure being located outside their typical locations. These aberrations can mimic pathological conditions and lead to a misdiagnosis if not carefully evaluated. Furthermore, variations in the positioning of the small bowel, including jejunal malrotation and ileal loops in the subhepatic or retroperitoneal spaces, can be mistaken for more common pathologies such as bowel obstruction or inflammatory conditions like tuberculosis.[4]

Radiological imaging is essential in detecting and characterizing these occult lesions, with advanced techniques such as CT and ultrasound being crucial for identifying the abnormal locations and providing valuable diagnostic clues. One of the challenges faced by radiologists is differentiating between benign anatomical variations and pathological conditions that may require surgical intervention. Some congenital anomalies, such as redundant sigmoid colon or malrotation, do not always cause symptoms but can lead to complications such as volvulus or ischemia if left undiagnosed. These conditions often require close monitoring and sometimes intervention, and imaging plays a critical role in their management.[1]

Moreover, it is essential to understand that these rare occult lesions may also be associated with other organ anomalies, as the embryologic origins of the gastrointestinal system are interconnected with the development of solid organs such as the liver and pancreas. For instance, agenesis of the left hepatic lobe or pancreatic abnormalities such as agenesis of the tail or the presence of arteriovenous malformations can also be detected incidentally during abdominal imaging. These conditions are far rarer compared to gastrointestinal lesions but may present with atypical abdominal symptoms, leading to confusion in diagnosis. While less common, the presence of such lesions necessitates a careful and methodical approach to diagnosis and management.[1]

Differentiating between these rare lesions and normal anatomical variants is a vital aspect of diagnostic imaging. While many of these variations are benign and do not require treatment, their recognition is crucial to avoid unnecessary surgical interventions or misdiagnoses. The role of the radiologist, therefore, becomes paramount in ensuring that these incidental findings are correctly identified and appropriately managed.

MATERIALS AND METHODS

Study Design: This study is a retrospective review focused on the radiological imaging of rare occult lesions in the gastrointestinal tract. The cases were randomly selected from the radiology department database, consisting of patients who were referred for imaging studies due to various mild to severe symptoms. The analysis was performed by a general radiologist working in a multispecialty hospital. This approach allowed for the comprehensive investigation and diagnostic assessment of gastrointestinal lesions using advanced imaging techniques. The primary imaging modalities employed in this study were multidetector computed tomography (CT) and high-end ultrasound, both of which provide high-resolution imaging crucial for identifying and evaluating these lesions.

Study Population and Imaging Techniques: The study sample consisted of patients across a wide age range, from the second to the fifth decade of life. This diverse patient population was selected to capture a broad spectrum of gastrointestinal anomalies that could arise at different stages of life. CT scans and ultrasound were performed on all patients, with additional imaging analysis carried out on the dedicated Picture Archiving and Communication System (PACS) platform. CT scans were performed in the axial plane, and multiplanar reconstructions (MPR) were generated to offer detailed and clear

views of the anatomical areas of interest. High-end ultrasound systems were utilized to provide high-resolution imaging, enabling precise evaluation of soft tissue structures within the gastrointestinal tract.

Data Collection and Image Analysis: Radiological images were reviewed by the principal radiologist, who assessed the lesions for abnormal locations within the gastrointestinal tract. The lesions were then categorized into three primary groups: gastric, small bowel, and large bowel lesions. Each image was carefully scrutinized to evaluate the nature, location, and involvement of the gastrointestinal region, allowing for an accurate understanding of the lesion's characteristics. The radiologist examined each lesion's relationship to surrounding structures to help identify whether it was congenital, or its differential diagnosis were considered. The radiologist compared the characteristics of each lesion with other common pathological conditions that may present with similar imaging features, such as obstructive or neoplasms or inflammatory conditions. The imaging characteristics were used to determine the most likely diagnosis and to rule out other emergency medical conditions.

Ethical Considerations: This research was conducted in accordance with institutional ethical standards. Patient imaging data was anonymized to ensure confidentiality and maintain privacy. As this is a retrospective, direct patient consent was not required, for analysing the past imaging data. The study's use of retrospective data was conducted ethically, with a strong emphasis on privacy and adhering to research protocols.

RESULTS

In this study, a total of 13 lesions were identified, which included nine bowel lesions and four miscellaneous lesions involving the hepatopancreatic region. The bowel lesions were further categorized into small bowel and large bowel lesions, as shown in [Table 1]. The miscellaneous lesions included two hepatic and two pancreatic lesions.

Gastric Lesions: In the gastric category, one case was observed where the gastric fundus was located posterior to the spleen, with the left kidney positioned below both the spleen and stomach. The spleen was anterolateral to the stomach, and both the spleen and stomach were situated within the left subdiaphragmatic region. The splenic colonic flexure was found to be in its normal position beneath the spleen.

Small Bowel Lesions: In the small bowel category, two cases of Chilaiditis syndrome were noted. One case showed right hepaticodiaphragmatic interposition of the small bowel loop along the right anterolateral aspect of the liver without any loop dilatation. Another case involved interposition of the small bowel loop at the anterior hepatic flexure into the hepaticodiaphragmatic region, with no free gas seen under the diaphragmatic domes in either case. Additionally, one case showed malrotation of the jejunal loops. A fourth case revealed a subhepatic location of the ileal loops, while the remaining bowel loops were in their normal anatomical positions.

Large Bowel Lesions: In the large bowel category, one case of Chilaiditis syndrome was observed, similar to the small bowel findings. The second case was that of a redundant sigmoid colon, where the sigmoid loop was located above the iliac crest without any signs of volvulus or abnormal dilatation. The third case showed posterior left subdiaphragmatic location of the splenic colonic flexure, with the spleen and stomach being positioned anteriorly. The fourth case involved a lateral abdominal wall hernia in the left subcostal region, where colonic herniation was observed into a defect in the same region with intact external oblique muscle.

Miscellaneous Lesions (Hepatopancreatic): Two hepatic lesions were identified, with left hepatic lobe agenesis in both cases. One of these cases also showed elongation of the right hepatic lobe, while the other had a normal craniocaudal length of the right lobe. Two pancreatic lesions were also noted. One case involved agenesis of the pancreatic tail, with a normal pancreatic head and body, as well as a normal pancreatic duct and peripancreatic fat plane. The second case was an intrapancreatic arteriovenous malformation (AVM), where multiple flow channels were seen within the pancreatic parenchyma, with both arterial and venous spectral tracings within the lesion.

Table 1: Lesions Identified in this Study

Region	Rare Occult Lesion	Number of Lesions	Total Number of Lesions
Gastrointestinal Tract		9	
Stomach	Gastric fundus located in retrosplenic left subdiaphragmatic region	1	1
Bowel Loop		8	
Small Bowel	Chilaiditis syndrome – Small bowel interposition in hepatodiaphragmatic region (anterior right perihepatic region)	1	
	Malrotation of jejunal bowel loop	2	
	Subhepatic right lumbar ileal loop location	1	
Large Bowel	Chilaiditis syndrome – Colonic interposition of bowel loops in right subdiaphragmatic region	1	
	Splenic colonic flexure interposition in posterior left subdiaphragmatic region	1	
	Redundant sigmoid colon	1	

	Left subcostal lateral abdominal wall hernia – colonic herniation into myofascial bulge in left subcostal location	1	
Miscellaneous (Solid Organ Interconnected Embryologically with GIT)		4	
Liver	Agenesis of left hepatic lobe	2	
Pancreas	Agenesis of tail of pancreas	1	
	Intrapancreatic AVM	1	

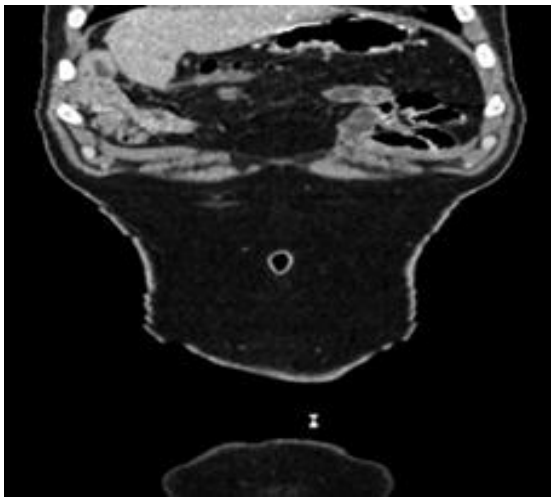

Figure 1. Hepaticodiaphragmatic interposition of small bowel loop

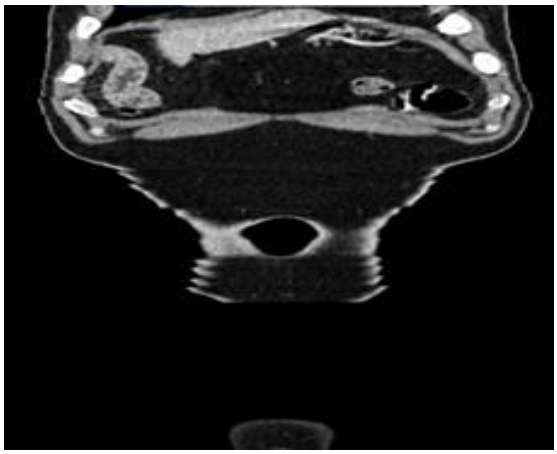

Figure 2. Hepaticodiaphragmatic interposition of small bowel loop

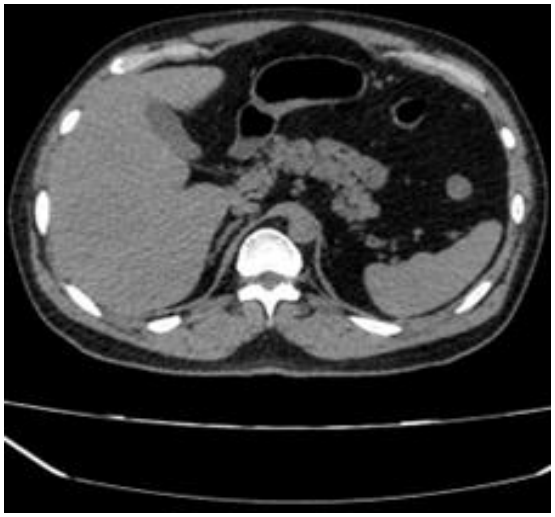

Figure 3. Case shows agenesis of pancreatic tail

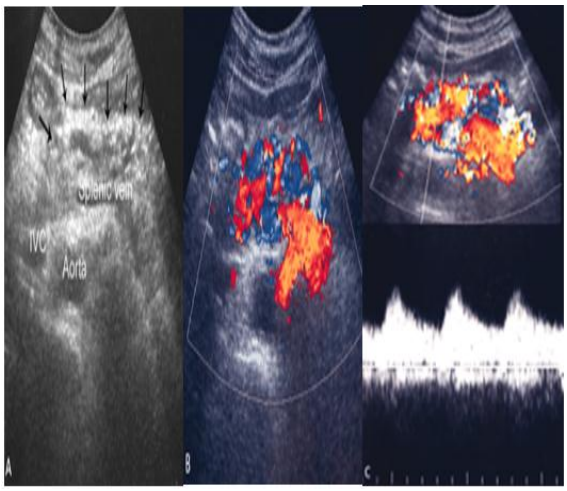

Figure 4: Arteriovenous malformation involving the body of the pancreas in a 55-year-old man. A, on gray scale ultrasonography, multiple tubular anechoic structures are shown in and around the pancreas (arrows). IVC indicates inferior vena cava. B, Color Doppler ultrasonography shows a large amount of color signals filled in and around the pancreas in a mosaic pattern. C, Spectral Doppler ultrasonography mainly shows arterial waveforms with relatively high velocity.

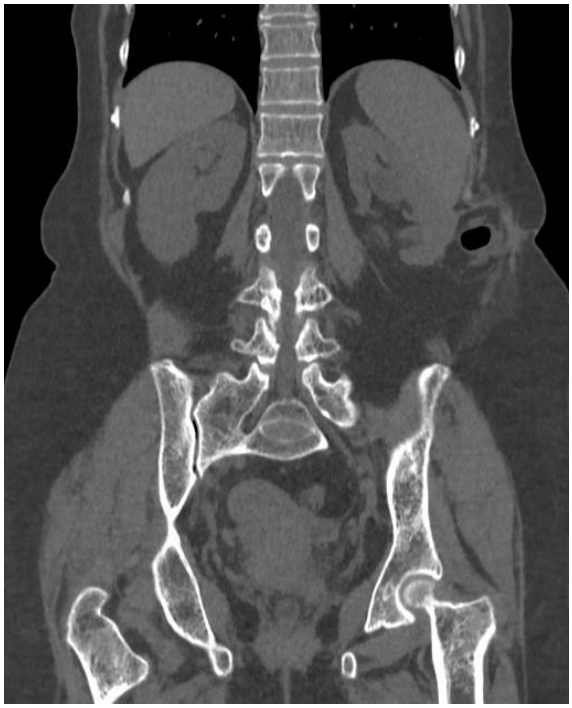

Figure 5. Coronal ct scan of abdomen shows Left Lateral abdominal wall hernia(intraparietal hernia with intact external oblique)

DISCUSSION

The lesions of the gastrointestinal tract described in this study are rare occult lesions, typically asymptomatic or presenting with mild symptoms. These lesions are often discovered incidentally during imaging studies. However, some, particularly occult hernias, can lead to serious complications, including bowel obstruction, and may require emergency intervention. This is in contrast to more common lesions, such as intussusception, which may sometimes be managed with conservative methods (Moore et al., 2023).[5]

Therefore, the significance of characterizing such lesions is important of better patient management.

The normal anatomical location of the stomach is within the left subdiaphragmatic region, anterior to the spleen. However, rare instances occur where the stomach is located in the retrosplenic left subdiaphragmatic region, a condition known as wandering spleen syndrome. Although this anomaly is usually an incidental finding, it can occasionally present with symptoms such as gastric outlet obstruction, splenic infarction, or even acute pancreatitis, presenting as a case of acute abdomen (Moore et al., 2023). In this study, however, the case did not present with any clinically significant symptoms.[5]

Chilaiditi syndrome, characterized by the interposition of small or large bowel in the hepatodiaphragmatic region (typically the anterior right perihepatic region), is another rare bowel lesion that is often discovered incidentally (Yun & Jung, 2023).[6]

While most cases of Chilaiditi syndrome are asymptomatic, it can lead to bowel obstruction (Yun & Jung, 2023), and its recognition is critical to avoid potential complications during liver biopsies or percutaneous transhepatic interventions, where bowel perforation could occur (Saha et al., 2024).[7]

Additionally, jejunal malrotation and subhepatic ileal loops are rare conditions that may present with unusual anatomical positions, often challenging for diagnosis, especially when they mimic more common conditions such as bowel obstruction (Dilmaghani et al., 2024).[8]

As noted, the splenic flexure of the colon can be interpositioned in the splenodiaphragmatic region as a normal variant, usually without symptoms. However, in some cases, this variant can cause colonic dysfunction, including the risk of accidental perforation during percutaneous intervention (Nalamolu & Chatterjee, 2022).[9]

A redundant sigmoid colon, also known as type 1 dolichocolon, is another rare condition that may remain asymptomatic or lead to various complications, such as urinary, digestive, or vascular issues. This condition can also present challenges in imaging and may increase the risk of volvulus (Dilmaghani et al., 2024). Furthermore, redundant sigmoid colon may complicate diagnostic procedures and is associated with a potential for iatrogenic injuries, including varicocele (Dilmaghani et al., 2024).[8]

Lesions involving aberrant gastrointestinal locations present significant diagnostic challenges due to their rarity and often subtle radiological features. The stomach, when displaced into the left subdiaphragmatic region, can be asymptomatic but may cause symptoms if compression by adjacent organs occurs. Such anomalies must be differentiated from other more severe diseases to avoid misdiagnosis (Moore et al., 2023).[5]

Similarly, jejunal lesions, such as right-sided proximal jejunal loops, require thorough evaluation to eliminate the possibility of incorrect diagnosis. These lesions can cause severe obstructive manifestations, necessitating comprehensive preoperative planning (Yun & Jung, 2023).[6]

Ileal loops can also present diagnostic difficulties, as they may resemble other lesions like tuberculosis of the terminal ileum. However, CT imaging typically reveals normal bowel wall thickness and pattern, which helps in differentiating these conditions (Saha et al., 2024).[7]

Redundant colon is a rare sigmoid colon variant that is characterized by a long, extended sigmoid loop in the upper abdomen, which should be differentiated from malrotation (Dilmaghani et al., 2024).[8]

Lateral abdominal wall hernia can present as defect in lateral abdominal wall with intact external oblique muscle/aponeurosis and the herniated bowel contents contained within the deep muscular layer (transversus abdominis and internal oblique muscles).[10]

In the category of miscellaneous lesions, hepatic and pancreatic anomalies were observed, with the left hepatic lobe agenesis being the most notable hepatic finding. These hepatic lesions are much less frequent than bowel lesions in this study, likely due to the study's focus on gastrointestinal abnormalities. Pancreatic lesions, including an intrapancreatic arteriovenous malformation (AVM), are even rarer. The pancreatic AVM presented with multiple flow channels within the pancreatic parenchyma, which could mimic normal variations. It is critical to differentiate such conditions from pathological lesions, especially when using high-end imaging modalities like CT or MRI (Moore et al., 2023).[5]

Pancreatic lesions, although connected to the embryological origin of the gastrointestinal tract, are relatively rare compared to bowel abnormalities, as noted in this study.[8] Finally, pancreatic AVM, which can present as a normal anatomical variation, should be carefully evaluated to avoid misdiagnosis as a pathological lesion (Moore et al., 2023).[5]

CONCLUSION

In conclusion, the findings of this study highlight the challenges clinicians may encounter in diagnosing occult or normal variant lesions within the

gastrointestinal tract. These lesions, although rare, can often be depicted in detail using advanced imaging techniques such as ultrasound and CT, which aid in differentiating benign variations from more serious pathological processes. Clinicians must pay close attention to less prominent structures in human anatomy, such as the ileum and stomach, to prevent misdiagnosis. Furthermore, it is important to differentiate unusual presentations, such as hepatodiaphragmatic interposition of bowel loops, from more typical subdiaphragmatic topographic locations in pathology. While most of these lesions are benign, longitudinal studies could provide the benefit of follow of these lesions without any surgical intervention or may point towards planned surgical intervention. Substantial benefits for both practitioners and patients by further work in this domain and thereby establishing a framework for the effective identification and management of incidental rare congenital lesions in the gastrointestinal system. (S sánchez moreno et al.).[11]

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