

# THE ROLE OF POINT OF CARE ULTRASOUND IN ADULT INTUSSUSCEPTION

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## **Abstract**

Adult intussusception is a rare clinical condition often characterized by vague symptoms in patients. The rarity of this condition can complicate and delay its diagnosis, especially when patients present to district hospitals that have limited imaging modalities, such as computed tomography (CT) scans. In such circumstances, point-of-care ultrasound (POCUS) assumes a pivotal role in diagnosing intussusception in adults, as ultrasonography devices are typically readily available in emergency departments. This paper presents a case involving a 23-year-old female who presented with nonspecific abdominal pain at a district hospital and was eventually diagnosed with intussusception. However, owing to the rarity of the case, the unusual nature of the presenting complaints, and the clinician's limited exposure and experience with ultrasound findings related to intussusception, the diagnosis posed a considerable challenge. Nevertheless, the timely and expert application of POCUS proved to be a life-saving intervention, as intussusception was successfully diagnosed at the bedside in the emergency department in tertiary hospital. This case underscores the critical importance of proper training in POCUS for diagnosing adult intussusception.

**Keywords:** Adult Intussusception, Ultrasound, Intestinal Obstruction, Emergency Department

## **Introduction**

Abdominal pain continues to be a leading cause of patient visits to the emergency department, accounting for 7-8.8% of all cases (1). Despite the availability of various imaging modalities, a significant proportion of patients presenting with abdominal pain receive no specific diagnosis. Furthermore, in district hospitals lacking comprehensive diagnostic imaging facilities such as computed tomography (CT) scans, the identification of adult intussusception, a rare condition often accompanied by nonspecific symptoms, poses a formidable challenge for emergency clinicians.

## **Case Presentation**

A 23-year-old Malay female with no prior medical history presented to the district hospital's emergency department complaining of epigastric pain persisting for the past three days. She described the pain as a pricking sensation radiating to her right hypochondriac region and back, notably worsening after meals, accompanied by multiple

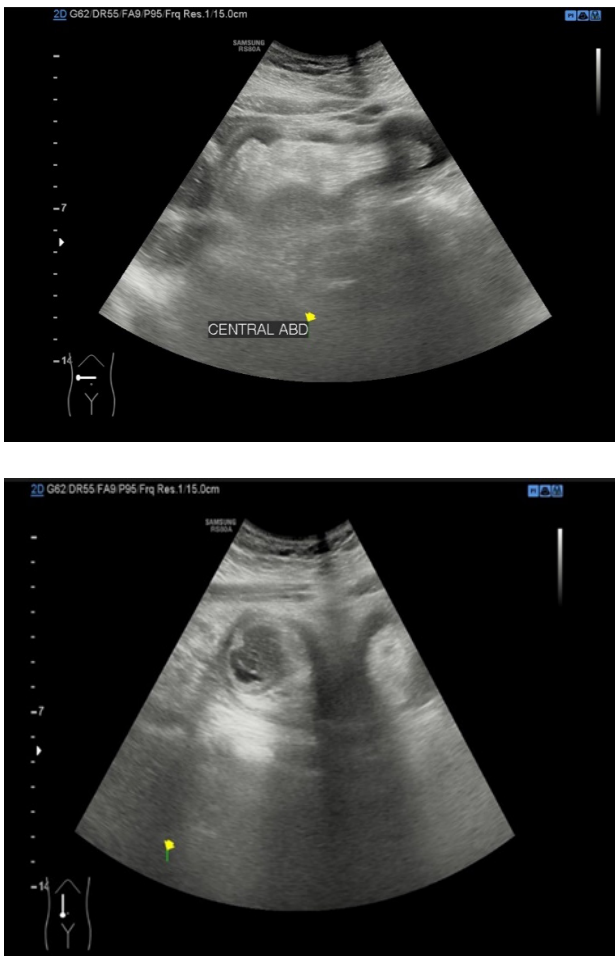
episodes of vomiting. She denied having a fever, yellowish skin discoloration, or any irregular bowel movements.

On physical examination, the patient exhibited signs of mild dehydration, but her blood pressure and heart rate remained within normal ranges. She did not display jaundice, and her respiratory examination yielded unremarkable results. Abdominal examination revealed tenderness in the epigastric and hypochondriac regions, with a negative Murphy's sign. No palpable mass was detected, and there were no signs of guarding in the abdomen. Bowel sounds were present, and a per rectum examination indicated the presence of brownish stool.

Laboratory findings showed an elevated white blood cell count of  $24.5 \times 10^3/\mu\text{L}$ , low hemoglobin levels of 11 g/dL, and elevated platelet counts of  $512 \times 10^3/\mu\text{L}$ . Liver and renal function tests, as well as amylase levels, were within normal limits. Chest radiography revealed clear lung fields and no free air under the diaphragm. Plain abdominal radiography did not indicate bowel dilation. Urinalysis revealed no abnormalities, and a urine pregnancy test

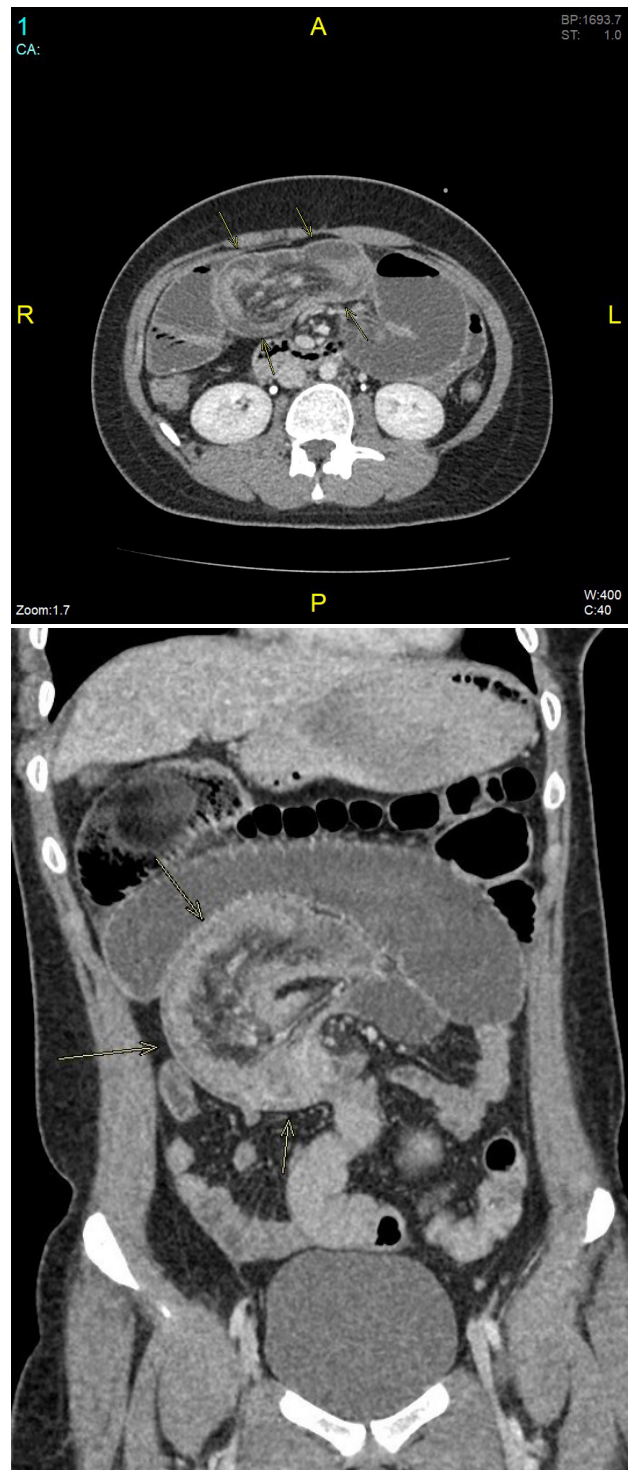
returned a negative result. Bedside ultrasound of the gallbladder and liver showed no abnormalities.

The patient was initially admitted to the district hospital for observation and pain management. However, during her hospital stay, she reported worsening abdominal pain and exhibited mild abdominal distension. Repeated plain abdominal radiography revealed a small degree of distention. Consequently, she was referred to a tertiary hospital for further evaluation and management by the surgical team. A repeat bedside abdominal ultrasonography, conducted by an emergency physician, revealed the presence of an intussusception (Figure 1).



**Figure 1:** (A) Ultrasound image (transverse plane) at the central part of the abdomen shows a mass with reniform shape (pseudo kidney sign), which represents the intussuscepted bowel; (B) Ultrasound image (sagittal plane) at the central part of the abdomen shows a mass with multilayered concentric rings of mass (target sign), which represents the intussuscepted bowel.

Subsequently, the patient underwent a contrast-enhanced abdominal CT, which confirmed jejunojejunal intussusception, leading to an emergency surgical procedure (Figure 2).



**Figure 2:** (A) Contrast enhanced CT abdomen in axial plane shows telescoping of distal jejunum into the proximal part (yellow arrows) giving the bowel in bowel appearance, which is suggestive of jejunojejunal intussusception; (B) Contrast enhanced CT abdomen in coronal plane shows telescoping part of distal jejunum into the proximal part (yellow arrows) giving the bowel in bowel appearance, which is suggestive of jejunojejunal intussusception.

The surgical intervention commenced with a diagnostic laparoscopy that subsequently confirmed the diagnosis

of jejunal intussusception. The proximal jejunum was found to be dilated, while the small bowel distal to the intussusception appeared collapsed. There were no intraabdominal pus or slough present. An attempted laparoscopic reduction of the intussusception proved unsuccessful, prompting a conversion to laparotomy. The intussusception was localized at a distance of 70 cm from the duodenojejunal flexure and 210 cm proximal to the ileocecal valve. The total length of the telescoped small bowel measured 70 cm, with a small bowel tumor identified as the leading point. During the surgical procedure, a segment of the small bowel measuring 70 cm in length was resected, leaving 280 cm of small bowel remaining. Biopsy of the tumor confirmed it to be a gastrointestinal stromal tumor (GIST). Following the operation, the patient underwent oesophagogastroduodenoscopy (OGD), revealing pangastritis with no additional tumors observed. The patient's postoperative recovery in the ward was uneventful, and she was discharged on the sixth day.

### Discussion

Intussusception is a condition commonly associated with children and ranks as the leading cause of abdominal emergencies in early childhood. It stands as the second most prevalent cause of intestinal obstruction after pyloric stenosis (2). In contrast, intussusception is a rare occurrence in the adult population, accounting for approximately 5% of all cases (3). This condition arises from the invagination of a segment of bowel and its mesentery, referred to as the intussusceptum, into the distal lumen of the same loop of bowel, known as the intussusciens. This invagination is driven by intestinal peristalsis, leading to subsequent intestinal obstruction and ischemia. While paediatric intussusception is predominantly idiopathic in nature, accounting for up to 90% of cases, the aetiology in adults is more diverse, with identifiable causes in approximately 90% of cases. Notably, two-thirds of adult cases involve either benign or malignant neoplasms (2). Intussusception can manifest at various points along the gastrointestinal tract, encompassing the stomach, small intestine, and large intestine. Among adults, intussusception primarily occurs in the small or large bowel, constituting 90% of cases, while instances of intussusception in the stomach or within surgically created stomas account for the remaining 10% (4). A comprehensive systematic review conducted by Hong et al. (5) revealed that most lesions were located within the enteric region, with the primary histological findings encompassing metastatic carcinoma, lymphoma, and gastrointestinal stromal tumors (GISTs). These tumors serve as leading points, instigating the invagination process in adult intussusception (6).

Intussusception, a condition primarily associated with paediatric patients, is traditionally characterized by a triad of symptoms: abdominal pain, palpable mass, and bloody stool. However, this classic triad manifests in only 15% of paediatric cases (2). In contrast, the clinical presentation of intussusception in adults is nonspecific, rendering diagnosis in this age group a challenging endeavour. Among the

most frequently reported symptoms in various case series, abdominal pain stands out as the predominant complaint, accounting for up to 80% of cases (5, 7-8). Additional reported symptoms include nausea, vomiting, and abdominal distention, which can mimic the presentation of abdominal obstruction (9, 10). The persistence of these uniform symptoms during the initial presentation often leads to diagnostic delays.

Ultrasonography, a readily available non-invasive tool in emergency departments, holds immense diagnostic value, particularly for emergency physicians. It offers reproducible images and real-time insights into anatomy, physiology, and pathology, guiding clinical decision-making. The American College of Emergency Physicians identifies five primary areas where Point of Care Ultrasound (POCUS) proves invaluable: diagnosis, resuscitation, symptom evaluation, procedural guidance, and therapeutic monitoring (11). POCUS has revolutionized emergency care since its introduction as a focused assessment tool for adult trauma patients over two decades ago. However, it is crucial to note that POCUS's diagnostic accuracy is operator-dependent. In the case of adult intussusception, sonography's diagnostic accuracy ranges from 64% to 78.2% (12-14). When a palpable abdominal mass is present, the diagnostic accuracy of ultrasonography can increase to 86.6% (14).

A study by Klinger et al. (15) demonstrated that inexperienced operators achieved an intussusception detection accuracy as low as 45%. This accuracy significantly improved when POCUS was performed by experienced operators holding a German Society of Ultrasound in Medicine (DEGUM) grade 2 or 3 certification. Operators with DEGUM grades 2 or 3 have completed a minimum of 6000 prior ultrasound examinations and 1000 examinations annually. Furthermore, the study revealed that high accuracy was attainable only when expert operators used high-end ultrasonography devices with specialized bowel presets for the patient. These findings underscore the multifaceted nature of POCUS's limitations in detecting adult intussusception, which encompass operator skills, disease characteristics, patient preparation, ultrasound equipment, and patient condition. Consequently, there is a scarcity of studies explicitly exploring the utility of POCUS in typical emergency department settings (16).

Sonographic imaging of intussusception exhibits variability when viewed from transverse and longitudinal planes. In the transverse plane, it often presents as the 'doughnut sign' or 'target lesion,' while in the longitudinal plane, it may resemble a 'pseudo-kidney' or 'sandwich appearance' (13, 17).

Computed tomography (CT) is widely acknowledged as the gold standard for intussusception detection, boasting a diagnostic accuracy ranging from 78% to 100% (5, 7). Beyond its diagnostic prowess, CT offers distinct advantages over alternative imaging modalities, as it not only identifies the causative lesion and its precise location but also characterizes the mass in relation to surrounding tissues and evaluates for signs of ischemic invagination (5, 7, 18).

These crucial findings aid clinicians in making informed decisions regarding the need for surgical exploration. CT imaging highlights the intricate anatomical relationships among the mesentery, intestinal wall, intestinal lumen, and fluid collections, yielding various distinctive signs that suggest intussusception, including the 'concentric circle sign,' 'comet tail sign,' and 'kidney-shaped sign' (19)

In our case, the diagnosis was delayed due to the patient's presentation with nonspecific abdominal pain, early blood investigations, and inconclusive plain radiographs. Initial bedside ultrasonography also failed to reveal any features suggestive of intussusception. Several factors contributed to this delay, including the timing and location of the pain, which led the clinician's focus toward the liver and gallbladder, as well as the operator's level of experience. Subsequent plain abdominal radiographs indicating intestinal obstruction prompted referral to a tertiary hospital. Ultimately, it was only through bedside ultrasonography performed by an experienced emergency physician at the tertiary hospital that intussusception was diagnosed, subsequently confirmed by a CT scan. This case underscores the critical importance of addressing discrepancies in clinical experience and knowledge, as such disparities can significantly impede timely diagnoses, particularly in the context of adult intussusception, a condition often characterized by vague symptoms. Furthermore, the patient presented at a district hospital where the absence of a CT scanner compounded the diagnostic challenge. Thus, there is an imperative need for comprehensive training, especially among emergency clinicians, to ensure competence in diagnosing intussusception using ultrasonography. Riera et al. (3) demonstrated the feasibility of training emergency physicians to accurately diagnose ileocolic intussusception with focused yet appropriate training modules.

### Conclusion

Accurate history-taking and a thorough physical examination are paramount for successful diagnosis. Nevertheless, a rare disease presenting with nonspecific symptoms can significantly impede timely diagnosis, jeopardizing the patient's well-being. Adult intussusception serves as an illustrative example of how point-of-care ultrasound in the emergency department can expedite the diagnostic process and lead to crucial, time-sensitive diagnoses.

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### Competing Interest

The authors declare that they have no competing interest and do not receive any financial support

### Ethical Clearance

Informed consent was obtained from the patient for inclusion in this report. Research and ethics committee approval for case reports is not a requirement according to Medical Research and Ethics Committee and Institute for Clinical Research Malaysia.

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