

Adenovirus-Induced Intussusception in a 3-Year-Old Patient: A Case Report and Review of the Literature

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ABSTRACT

Intussusception is characterised by invagination of the proximal bowel segment into the lumen of a distal segment leading to acute bowel obstruction. In the pediatric population, idiopathic ileocolic intussusception is the most common form with a small subset of the patient's presenting with concurrent adenovirus infection. We present a rare case of adenovirus-induced intussusception in a pediatric patient, highlighting the potential association of viral factors and GI conditions.

Three y/o male presents' with a 3-day history of fever, vomiting and colicky abdominal pain. Imaging tests revealed characteristic "target sign" which along with the presenting symptoms confirmed the diagnosis of ileocolic intussusception. Due to the persistence and severity of the patient's symptoms, surgical intervention was undertaken to relieve the obstruction and a subsequent PCR confirmed concurrent adenovirus infection.

Although a causative factor for only a subset of pediatric intussusception cases, it remains necessary nevertheless to understand the pathogenesis and raise awareness among healthcare workers of the potential link between adenovirus infection and intussusception in the pediatric population.

Keywords: Intussusception, Target sign, Surgical Intervention, PCR, Adenovirus.

INTRODUCTION

Intussusception is an acute medical emergency, characterised by invagination of the proximal segment of the intestine into the adjoining intestinal lumen, seen primarily in infants and young children with peak incidence between 3-24 months of age.^[1-3]

While the etiology of intussusception is multifactorial, viral triggers including adenovirus infection have been reported in a subset of cases.^[4,5]

Human adenoviruses are non-enveloped double-stranded DNA viruses, associated with respiratory and gastrointestinal

illnesses, with over 50 types reported to infect humans. The prevalence of adenovirus-induced intussusception ranges anywhere from 7% to upto 51% across various countries.^[6] Although the exact pathogenesis is unclear, hypertrophy of the Peyer patches in the setting of viral infection can lead to intussusception with approximately 30% of patients experiencing viral illness before the onset of intussusception.

The objective of this case report is to discuss the clinical presentation, diagnostic modalities, management and prognosis in a

pediatric case of adenovirus-induced intussusception. We aim to highlight adenovirus infection as a potential causative factor in pediatric intussusception and bring awareness among healthcare workers regarding the association of adenovirus infection and intussusception in children.

CASE PRESENTATION

A 3 y/o male presented to the Emergency Department with a 3-day history of fever, vomiting and severe, cramping and colicky abdominal pain. The patient was restless with excessive crying. He had no significant past medical or surgical history. The patient's initial vital signs were within normal limits.

The abdominal examination revealed a soft, non-tender, non-distended abdomen which was painless on palpation. No palpable masses were noted along with normal bowel sounds. Per rectal examination revealed fecal masses with yellow colour in the ampoule but no blood.

On the initial ED visit, an ultrasonographic examination of the abdomen and pelvis was ordered, which revealed a “target lesion”, 32 mm in diameter, in the right lower quadrant (RLQ), raising the suspicion of intussusception. Subsequently, on the same day, a gastrointestinal contrast study was performed (Figure 1), which further raised the suspicion for intussusception.

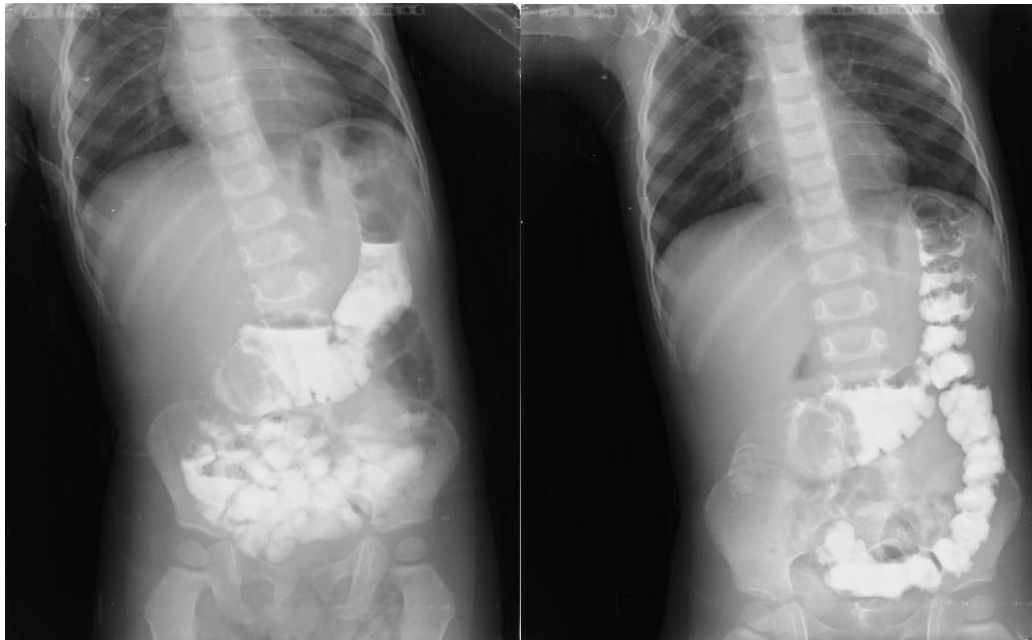


Figure 1: Gastrointestinal contrast study suggesting bowel obstruction.

Despite cessation of vomiting, the patient continued to experience intermittent severe abdominal pain. Given the persistent clinical symptoms and the possibility of intermittent intussusception, a CT scan was ordered.

CT scan was performed under general anaesthesia on the patient's right lower quadrant of the abdomen. It was noted that the walls of the ascending colon appeared swollen with abdominal fat and small-calibre mesenteric vessels potentially protruding

into the lumen alongside the loops of the ileum. The classic intussusception finding - “target sign” was observed in the RLQ (Figure 2). Moreover, slight displacement of the superior mesenteric vein at the level of the middle and lower portion of its course was observed, consistent with the findings of intussusception. Subsequently, the patient was diagnosed with *ileocolic Intussusception*.

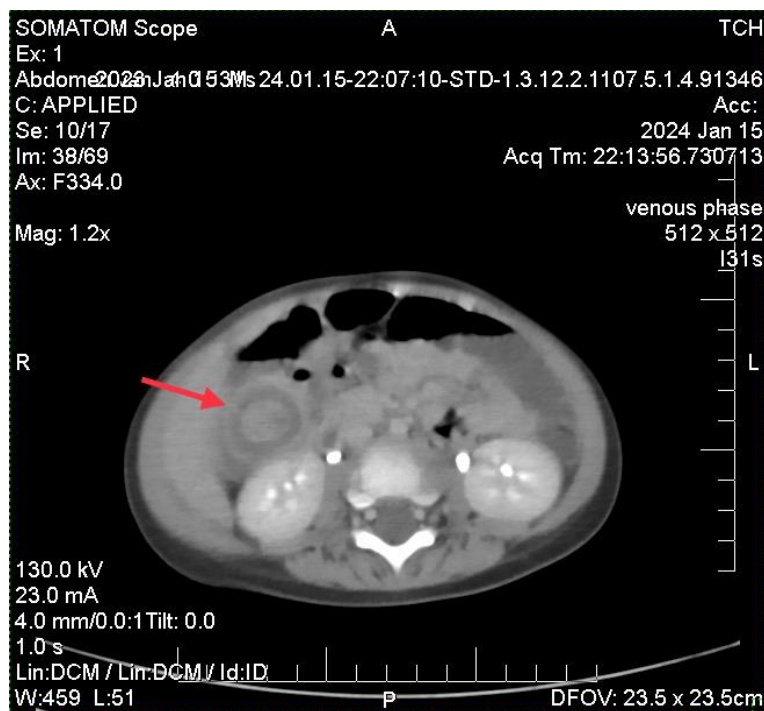


Figure 2: CT scan of the abdomen reveals target sign (red arrow) .

Taking into account the age of the patient along with the persistent and severity of the abdominal pain, a decision to proceed with urgent midline laparotomy was undertaken. The abdomen was opened up which revealed enlarged lymph nodes and intussusception of the terminal ileum into the cecum was observed. The intussusception was resolved using suction, enlarged lymph nodes were excised from the ileocecal region, intestinal potency was confirmed and the peritoneum was closed.

Although surgical intervention treated the intussusception, patients' fever persisted along with mild abdominal pain.

Given the patient's persistent clinical presentation, precautionary Tamiflu (also known as oseltamivir) was started to cover for possible influenza virus infection. Based on the enlarged lymph nodes and patients refractory symptoms, a PCR of the throat

swab was performed confirming the diagnosis of adenovirus infection. Tamiflu was discontinued and supportive care and management tailored to adenovirus infection was initiated.

DISCUSSION

We present a case report describing a 3 y/o patient with intussusception and concurrent adenovirus infection underlining the interplay and complexities of pediatric GI illnesses and viral infections.

Ileocolic intussusception is the most common type of intussusception encountered in the pediatric population. Majority of the cases of pediatric intussusception are idiopathic, with only 10% having an identifiable underlying etiology.^[7] Despite this several causative factors are believed to contribute to the pathophysiology of pediatric intussusception (Table 1).

Table 1: Causative Factors in cases of Pediatric Intussusception.^[8]

| Causative Factors | |
|-----------------------------|---|
| Viral infections | Commonly associated with gastrointestinal infections, particularly adenovirus, rotavirus, and human herpesvirus 6. |
| Hypertrophied Peyer's Patch | Hypertrophy of the Peyer's Patches in the setting of viral infections including adenovirus and rotavirus can lead to intussusception. |
| Meckel's diverticulum | A congenital malformation of the gastrointestinal tract, which can become the lead point for intussusception. |
| Henoch-Schonlein purpura | A systemic vasculitis affecting small blood vessels, which can lead to intestinal inflammation and intussusception. |
| Intestinal polyps | Benign growths in the intestinal lining that can serve as the lead point for intussusception. |

| | |
|----------------------|--|
| Hirschsprung disease | A congenital condition characterized by the absence of nerve cells in the intestines, which can lead to bowel obstruction and intussusception. |
| Associated diseases | Non infectious etiologies include intestinal allergies, Celiac disease, and Crohn disease. |

In the pediatric population, intussusception is one of the most common acute abdominal emergencies. Young children often present with acute onset of colicky abdominal pain, excessive irritability and crying along with vomiting shortly after the onset of pain. In nearly half of the cases, the stool has the characteristic “currant jelly” appearance due to the presence of blood and mucus. On physical examination, upto 60% of patients have a palpable “sausage-shaped mass”. The classic triad of abdominal pain, currant jelly stool and sausage shaped palpable masses is reported in only 15% of the cases.^[8,9]

The diagnostic criteria of acute Intussusception in infants and young children is listed in Table 2. The diagnosis of intussusception in this case was supported by imaging findings including ultrasound, GI contrast study and CT scan, revealing the characteristic “target sign” - concentric Hypertension double ring, and bowel obstruction. Concurrent PCR testing for the presence of adenovirus infection, supports the existing literature showcasing a possible association of adenovirus infection and pediatric intussusception.

Table 2 : Level 1 of Diagnostic Certainty of Brighton Collaboration Intussusception Working Group for Diagnosis of Acute Intussusception in Infants and Young Children.^[10]

| | |
|---------------------|---|
| Surgical criteria | The demonstration of invagination of the intestine at surgery |
| Radiologic criteria | The demonstration of invagination of the intestine by either air or liquid contrast enema; or the demonstration of an intra-abdominal mass by abdominal ultrasound with specific characteristic features ¹ that is proven to be reduced by hydrostatic enema on postreduction ultrasound |
| Autopsy criteria | The demonstration of invagination of the intestine |

¹Target sign or doughnut sign on transverse section and a pseudo-kidney or sandwich sign on longitudinal section.

Note - In presenting the level 1 diagnostic criteria for acute intussusception, our table format was inspired by the structure and layout of the table presented in - Boudville, I. C., Phua, K. B., Quak, S. H, et al. (2006). The epidemiology of paediatric intussusception in Singapore: 1997 to 2004. *Annals of the Academy of Medicine, Singapore*, 35(10), 674–679.

In the pediatric population, the first line treatment for ileocolic intussusception is ultrasound-guided or fluoroscopy pneumatic or hydrostatic enema which is proven to be successful in 85-90% of the cases.^[11]

However, in our case as the patient had persistent and severe abdominal pain the decision for urgent midline laparotomy was agreed upon. Moreover, antiviral therapy with Tamiflu was initiated empirically but was later discontinued upon PCR confirmation of adenovirus infection. Although surgical intervention remains an important management approach for the treatment of intussusception, the role of antiviral therapy in these cases remains unclear, requiring further research into this aspect.

Limitations of the case report include its retrospective nature and absence of long-

term follow up. Moreover, the ultrasound scan conducted during the diagnostic evaluation of the patient was not retained although the GI contrast study and CT scan were retained for retrospective review.

CONCLUSION

The case report discusses the diagnosis and management of intussusception in a pediatric patient with concurrent adenovirus infection. It underscores the importance of considering viral etiologies as a potential trigger for GI illnesses and highlights the further need for research to understand the pathogenesis of the relationship between adenovirus and pediatric intussusception.

Declaration by Authors

Human subjects: Consent was obtained or waived by all participants in this study. Conflicts of interest: In compliance with the ICMJE uniform disclosure form, all authors declare the following: Payment/services info: All authors have declared that no financial support was received from any organization for the submitted work. Financial relationships: All authors have declared that they have no financial relationships at present or within the previous three years with any organizations that might have an interest in the submitted work. Other relationships: All authors have declared that there are no other relationships or activities that could appear to have influenced the submitted work.

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