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Case Report

A rare case report of patent vitellointestinal duct presenting as a periumbilical pain in an adult ☆

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ABSTRACT

The vitellointestinal duct (VID) is an embryological remnant of the vitelline duct, a structure that connects the developing fetus to the yolk sac and is responsible for the nutritional support of the fetus during the early embryological days. The VID usually gets obliterated by the fifth to ninth week of gestational age after the establishment of placental nutrition. The patent VIDellointestinal duct is a relatively rare congenital condition that occurs in approximately 2% of the general population, with the most common presentation being Meckel's diverticulum. Complete patency is rarer, occurring in 0.1% of the general population. The complete persistence of the VID results in enterocutaneous fistula, and the presentation may vary, ranging from cutaneous manifestations like skin lesions, granulomas, abscesses, or umbilical discharge to abdominal symptoms including acute abdominal pain and hematochezia. Some patients are even asymptomatic and are detected incidentally. We present a rare case of complete patency of the VID in a 30-year-old adult male presenting with acute periumbilical pain. Imaging findings guided the diagnosis, and surgical resection with histopathological examination further confirmed the condition.

Introduction

The vitellointestinal duct (VID), or an omphalomesenteric duct, appears as a long, tubular structure at the beginning of embryonic life. It connects the midgut to the yolk sac during the third week of fetal development. It typically regresses between the fifth and ninth weeks of development, leaving a solid cord from the ileum to the umbilicus [1]. VID anomalies in children are a group of entities that result from complete or partial lack of obliteration of the duct [2]. Meckel's diverticulum is the most common form due to partial obliteration of the VID. It is present in 2% of the population and is known to be one of the most common congenital gastrointestinal anomalies [3,4]. Less commonly, other anomalies that occur due to failure of involution of the VID include omphalomesenteric fistula, enterocyst, or umbilical polyp. Of all the anomalies of the VID, complete patency is the rarest, oc-

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curring in less than 0.0063%-0.067% of the population. The condition is most commonly diagnosed within the first few years of life, with a slightly increased incidence in males [5–7].

Symptoms usually occur during the first decade of life at an average patient age of 2.5 years. According to a review of experiences at the Mayo Clinic, the length of the diverticulum directly correlates with the presence of symptoms. Patients with a diverticulum length of more than 2 cm in length are more likely to be symptomatic [3,8]. This malformation has various manifestations and can be difficult to diagnose initially. The patient might show symptoms of the acute abdomen including abdominal pain due to inflammation, hematochezia or Malena, intussusception, obstruction, bowel prolapse, and perforation. Hemorrhage is the most common complication of Meckel's diverticulum. Cutaneous manifestations of completely patent omphalomesenteric duct include umbilical mass, granulation tissue, or discharge [6,7]. Published reports also show neoplasms may develop in omphalomesenteric duct remnants, indicating controversy for resection in asymptomatic patients [9]. Surgical intervention is recommended for persistent symptoms associated with persistent VID [6]. We present a case of complete patency of omphalomesenteric duct in 30-year-old male who presented in the emergency department as an acute abdominal pain, and was diagnosed radiologically via a computed tomography (CT) scan and was managed surgically.

Case presentation

A 30-year-old male presented to the emergency department with acute periumbilical pain that had been ongoing for 8 hours. The pain was localized in the periumbilical region, was insidious on the onset, and was nonradiating, with no aggravating or relieving factor. It was accompanied by nausea and 2 episodes of vomiting. The patient had no history of smoking but was a social drinker. There were no changes in bowel and bladder habits, and the past medical history was unremarkable.

Upon examination in the periumbilical area, tenderness was observed along with guarding and rigidity. Laboratory tests revealed mild leukocytosis, while serum amylase and lipase levels were within normal ranges. An ultrasound was performed, which showed a hypoechoic lesion underneath the umbilicus. Subsequently, a CT scan revealed a tubular structure approximately 6-7 cm long, originating from the antimesenteric border of the distal ileum and extending to the umbilicus. The CT scan also revealed wall enhancement, significant fat stranding in the surrounding area, and a trace amount of free fluid. Additionally, several mesenteric lymph nodes were prominently enhanced, with the largest measuring 12 × 8 mm (Figs. 1–4). The tubular lesion is shown in the supplemental video of the manuscript.

The patient was scheduled for surgery after a preliminary diagnosis of an inflamed patent omphalomesenteric duct was established on the basis of the findings. During the procedure, the communicating duct was found to be approximately 12.5 cm from the ileo-colic junction. A wedge excision of the duct was performed, and the ileum was repaired in 2 layers.

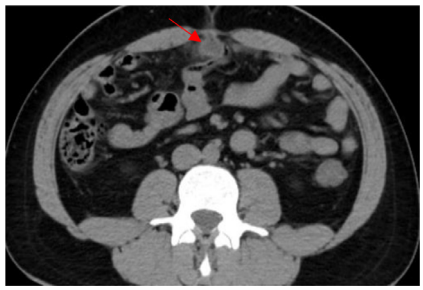

Fig. 1 – Noncontrast axial CT image shows awell-defined lesion with acentral cystic area underneath the umbilicus. No calcifications or fat component (shown by red arrow).

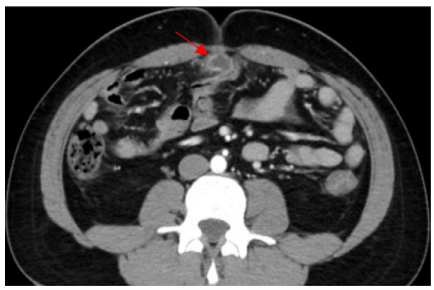

Fig. 2 – Contrast axial CT image shows a well-defined peripherally enhancing lesion underneath the umbilicus (shown by red arrow).

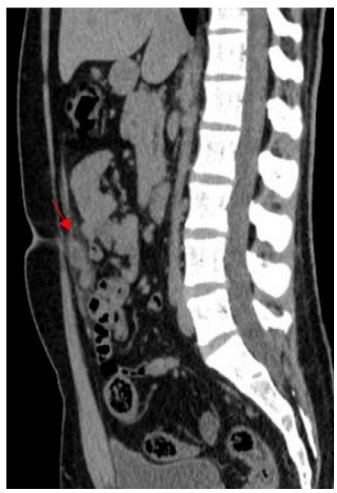

Fig. 3 – Sagittal noncontrast CT image shows tubular lesion beneath the umbilicus extending inferiorly (shown by red arrow).

The surgery proceeded uneventfully, and the patient was discharged the following day. The excised tissue was sent for histopathological examination, which revealed the presence of intestinal lining consistent with a persistent VID. Additionally, gastric and duodenal heterotopia were observed in some areas, as depicted in (Figs. 5 and 6).

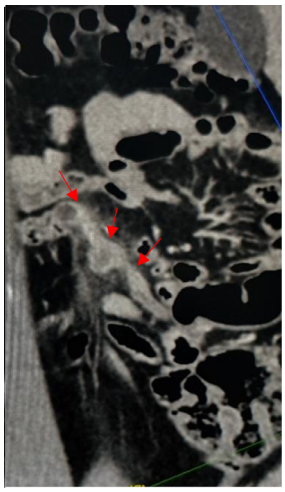

Fig. 4 – Sagittal contrast CT image shows the wall enhancing tubular lesion (shown by the red arrows).

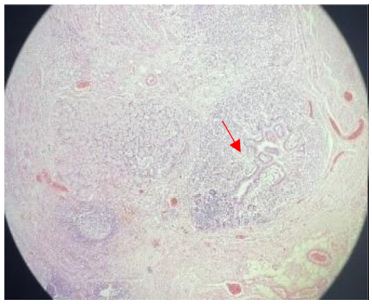

Fig. 5 – Gastric heterotopia (gastric gland shown by red arrow).

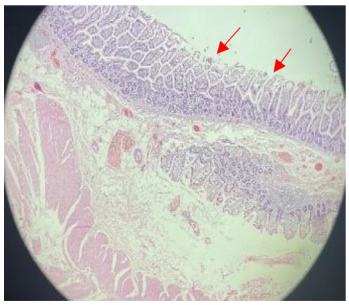

Fig. 6 – Small intestinal lining (shown by red arrow).

Discussion

The VID is an embryological vestige that establishes a connection between the fetus and the yolk sac, playing a pivotal role in early nutritional support. Typically, it undergoes involution and ceases to exist during the fifth to ninth week of gestation [3,10]. Numerous congenital abnormalities have been documented, categorized according to the extent and location of the remaining patent duct between the antimesenteric border of the ileum and the umbilicus. These anomalies comprise a diverticulum, omphalomesenteric fistula, omphalomesenteric cyst, and a fibrous band connecting the umbilicus and the ileum [3]. Complete patency of the duct is a rare phenomenon that occurs only in 0.1% of individual, often occurring in newborns than adults, as reported by Kohn et al. A systematic review also reported just 2.5% of cases of patent VID in persons over 18. Though rare, there are incidences that have been reported in the adult population as well, according to the World Journal of Gastroenterology [7]. In our case, we encountered a remarkable rarity in terms of the complete persistence of the duct and the patient's age.

In relation to the symptoms, patent VID manifests with various symptoms, such as abdominal pain, rectal bleeding, intestinal obstruction, umbilical drainage, and umbilical hernia. These symptoms tend to be age-dependent and typically emerge before the age of 4 years. Approximately 40% of affected children exhibit symptomatic lesions, similar to the finding of the study by Vane et. al. where 85 children out of 217 were found to have symptomatic lesions, 28 of them had rectal bleeding, and 28 of them had intestinal obstruction. This anomaly is generally asymptomatic in adults [11,12]. However, the finding of the patient reported by Mohannad et al. contrasts with the statement as their patient was a 34-year-old adult with recurrent symptoms of vague abdominal pain for a few hours that resolved on its own. Their patient was later found to have a small bowel obstruction and midgut volvulus associated with the patent VID [13]. Similarly, our patient also had symptoms of abdominal pain for 8 hours, along with nausea and vomiting, which defies the usual norm. Our patient, nevertheless, had none of the other features like rectal bleeding, umbilical drainage hernia, or other obvious obstructive symptoms.

Patent VID is commonly a difficult initial diagnosis [12]. It is seldom possible to clinically diagnose these conditions. Also, such a diagnosis is not something one anticipates encountering during clinical practice, let alone an unusual presentation in an adult [7]. It is hence no surprise that pre-operative diagnoses of these conditions have been reported to occur in less than 10% of cases. These findings of Meckel's diverticulum or the patent VID are often times incidental findings during abdominal imaging or surgeries [2]. Thus, imaging is crucial in diagnosing the condition, specifically high-resolution imaging such as CT and contrasting techniques. These imaging modalities are particularly valuable for locating and surgical planning [12]. It is, therefore, crucial for radiologist to be vigilant for the findings of the condition though rare. However, it is equally important for surgeons to rule out VID-related conditions in patients undergoing surgical evaluation for chronic abdominopelvic pain whose imaging findings are inconclusive. Our patient had presented with an acute abdomen, so ultrasonography (USG) of the abdomen was done as a first line of imaging investigation. However, the diagnosis of these anomalies is seldom reliant solely on USG findings. Widni et al. asserted that USG lacks accuracy in distinguishing true negatives from false positives when diagnosing urachal remnants. Nonetheless, when performed by skilled physicians, it can still play a significant diagnostic role in detecting these types of anomalies and is capable of showing the communicating air-filled tubular structure between the small bowel and

umbilicus [3,14]. In the case of our patient, USG showed no abnormality, thus, CT of the abdomen was opted as the next imaging modality, which revealed a tubular structure, 6-7 cm in length arising from the antimesenteric border of the distal ileum extending to the umbilicus. As the evidence supports, the diverticulum longer than 2 cm is symptomatic, which is also the case with our patient.

Surgical correction of the defect is the mainstay of managing patent VID, where open and laparoscopic approaches have been attempted successfully. Delays in surgical correction of these malformations have been related to abdominal complications such as constricted hernias, bowel perforation, hemorrhage, and tissue infections [12]. Though small intestine obstruction due to patent VID, particularly in adult patients, is extremely rare, with very few cases reported in the literature, it is considered a surgical emergency [11,15]. Our patient also underwent laparoscopy-assisted resection of patent VID with wedge ileal resection with ileal repair with appendectomy. The tissue sent for histopathological examination showed the presence of intestinal lining consistent with a patent VID. Additionally, gastric and duodenal heterotopia were observed in the tissue section of our patient. It is important to note that not all the cases of the VID would show the same histopathological features as depicted by a case of a 61-year-old male in a study done by Junior et al. [12], which shows no such features of heterotypia.

The condition of patent VID is due to the failure of their obliteration during development. These conditions are very rare to be found in adults, but it would be reasonable to put in congenital anomalies as a differential going into the definitive investigations after initial assessments fail to reveal notable common pathologies. The nearest possible differential for this case would be a postoperative sinus or fistula and urachal remnant. History of surgery and open sinus tract from the skin surface can differentiate from VID and its course to the apex of urinary bladder can identify the urachal remnant. Emergent management might be necessary at times. The radiologist and the surgeons need to coordinate for the condition to be sought.

Conclusion

In conclusion, our report highlights the rare occurrence of complete patency of the VID in an adult with acute periumbilical pain. High-resolution imaging, such as CT, plays a crucial role in diagnosis and surgical planning for this condition. Collaboration between radiologists and surgeons is essential in identifying and managing such uncommon anomalies. Further research is needed to enhance our understanding of this condition in adults with atypical abdominal presentations.

Patient consent

The authors claim that there is no personal information in this report that might be used to identify the patient. Written, informed consent was obtained from the patient.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.radcr.2024.01.003.

REFERENCES

[1] Levy AD, Hobbs CM. From the archives of the AFIP: Meckel diverticulum: radiologic features with pathologic correlation. Radiographics 2004;24(2):565–87.
[2] Kohn D, Tian J, Valdez A, McGrath- Blagrove T, Abouelsaad C, Louis MA, et al. Patent omphalomesenteric duct in a newborn; a rare finding and presentation. J Pediatr Surg Case Rep 2022;84:102355.
[3] Inarejos Clemente EJ, Navarro OM, Navallas Irujo M, Ladera E, Colombo C, Suñol M, et al. Omphalomesenteric duct anomalies in children: a multimodality overview. Radiographics 2021;41(7):2090–110.
[4] Lau C, Au D, Wong K. Application of indocyanine green in pediatric surgery. Pediatr Surg Int 2019;35:1035–41.
[5] Kadian YS, Verma A, Rattan KN, Kajal P. Vitellointestinal duct anomalies in infancy. J Neonatal Surg 2016;5(3):30.
[6] Agrawal Sanwar, Memon Ameen. Patent vitellointestinal duct. BMJ Case Rep 2010;2010 bcr1220092594.
[7] Solomon-Cohen E, Lapidoth M, Snast I, Ben-Amitai D, Zidan O, Friedland R, et al. Cutaneous presentations of omphalomesenteric duct remnant: a systematic review of the literature. J Am Acad Dermatol 2019;81(5):1120–6.
[8] Park JJ, Wolff BG, Tollefson MK, Walsh EE, Larson DR. Meckel diverticulum: the Mayo Clinic experience with 1476 patients (1950–2002). Ann Surg 2005;241(3):529.
[9] Boonthai A, Mullassery D, Losty PD. Omphalomesenteric duct remnants. In: Puri P, Höllwarth ME, editors. Pediatric surgery: diagnosis and management. Cham: Springer International Publishing; 2023. p. 543–50. [Internet]. doi:10.1007/978-3-030-81488-5_42.
[10] Trinder MW, Balasuriya HD, Warner M. Patent vitellointestinal duct presenting as an umbilical abscess: a novel operative approach to a rare adult presentation. ANZ J Surg 2021;91(9):E610–11.
[11] Mahato N. Obliterated, fibrous omphalo-mesenteric duct in an adult without Meckel's diverticulum or vitelline cyst. Rom J Morphol Embryol 2010;51(1):195–7.
[12] Junior JAL, Júnior JVM, de Vasconcelos LMT, da Silveira Moreira SO, Brilhante F das CB. Surgical treatment of patent omphalomesenteric duct. J Pediatr Surg Case Rep 2021;71:101883.
[13] Eledreesi M, Aladwani M, Alnawaiseh O, Arafat Y. A case report of adult patent vitellointestinal duct sac and midgut volvulus. Surg Sci 2022;13(3):105–9.
[14] Bertozzi M, Recchia N, Di Cara G, Riccioni S, Rinaldi VE, Esposito S, et al. Ultrasonographic diagnosis and minimally invasive treatment of a patent urachus associated with a patent omphalomesenteric duct in a newborn: a case report. Medicine (Baltimore) 2017;96(30):e7087.
[15] Markogiannakis H, Theodorou D, Toutouzas KG, Drimousis P, Panoussopoulos SG, Katsaragakis S. Persistent omphalomesenteric duct causing small bowel obstruction in an adult. World J Gastroenterol WJG 2007;13(15):2258.