

Silent Diverticulum, Sharp Consequences: A Rare Case of Meckel's Perforation by Ingested Dental File

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ABSTRACT

The most common gastrointestinal tract abnormality, which occurs as a result of incomplete obliteration of the vitelline (omphalomesenteric) duct in embryo formation, is Meckel's diverticulum. Objects like toothpicks, fish bones or dental instruments may be lodged in the lumen of the diverticula causing local inflammation and in uncommon cases, perforation. A 26-year-old male patient presented to the emergency department after accidentally swallowing a dental file during a routine dental procedure. He was asymptomatic, not haemodynamically deranged, and showed no signs of acute abdomen. The file was located in the distal jejunum without the presence of free intraperitoneal air or fluid on a non-contrast Computed Tomography (CT) scan of the abdomen. Initial follow up radiograph showed progressive transit of the foreign body. However, further serial radiographs at a time interval of six hours showed no change in position. A follow-up non contrast CT scan revealed the object in the distal ileum, where it had perforated the wall of a blind-ending tubular structure triggering the suspicion of a perforated Meckel's diverticulum. Laparoscopic diagnosis of a perforated Meckel's diverticulum was made. Laparoscopic segmental resection of the affected bowel and primary ileo-ileal anastomosis was done. Histopathological examination showed the presence of a true diverticulum with mucosal ulceration, haemorrhagic infarction, and transmural inflammation. Neither ectopic gastric nor pancreatic mucosa was identified. Recovery after surgery was uneventful, and the patient was discharged. This case report highlights a rare but important clinical complication which is to be suspected and treated without delay and helps the future clinicians in deciding on an appropriate timely management.

Keywords: Computed tomography, Foreign body ingestion, Gastrointestinal imaging, Ileal anomalies, Meckel's diverticulum, Small-bowel perforation, True diverticulum

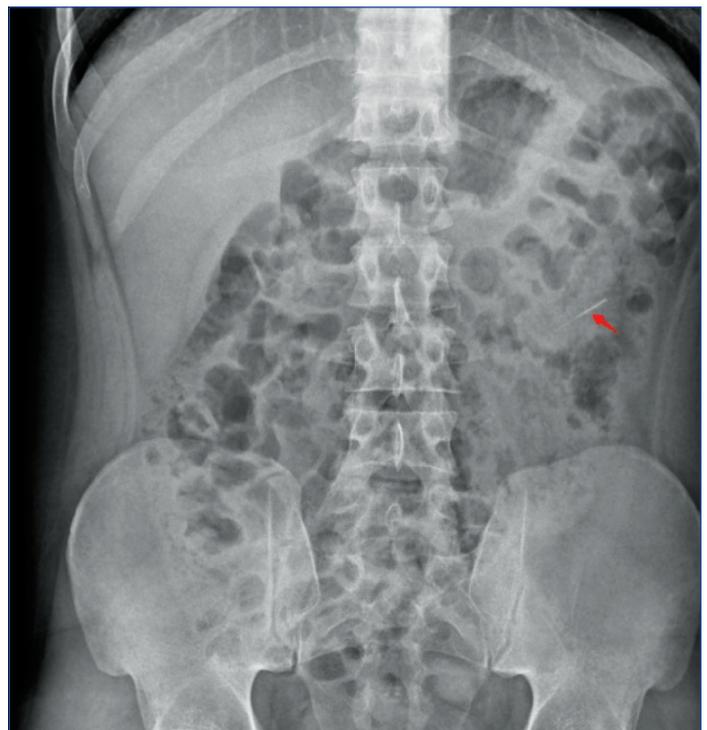
CASE REPORT

A 26-year-old male came to the emergency department with an accidental ingestion of a dental file during a dental procedure. He denied complaints of vomiting, haematemesis and abdominal pain. His surgical history was not significant. He had no co-morbidities and systemic examination did not show any abnormalities. Vital signs were stable, and laboratory investigations were normal.

An erect antero-posterior radiograph of the abdomen showed a linear radiopaque object in the left lumbar region, likely within small bowel as shown in [Table/Fig-1,2]. A non-contrast CT scan revealed it to be within the distal jejunum, with no signs of perforation, as in [Table/Fig-3]. Initial follow-up X-ray taken 16 hours post-ingestion showed caudal progression of the foreign body as noted in [Table/Fig-4]. Further follow up X-ray at six-hour interval showed no progressive movement of the dental file as seen in [Table/Fig-5]. A repeat non contrast CT abdomen demonstrated the file to be lodged in the distal ileum, piercing through the wall and causing perforation of a blind-ending structure which was suspicious for a Meckel's diverticulum [Table/Fig-6a,b]. The appendix was identified separately and appeared normal.

Patient underwent emergency abdominal laparoscopy 24 hours post ingestion in view of CT revealing the dental file to be perforating the Meckel's diverticulum and to avoid further complications of perforated bowel. Intraoperative findings revealed a Meckel's diverticulum, located 60 cm proximal to the ileocecal junction and the dental file piercing its wall [Table/Fig-7]. Segmental resection of the diverticulum as seen in [Table/Fig-8] and ileo-ileal anastomosis was done. Histopathological examination revealed the presence of a true diverticulum with ulceration and haemorrhagic infarction as depicted by [Table/Fig-9]. Postoperative period was uneventful,

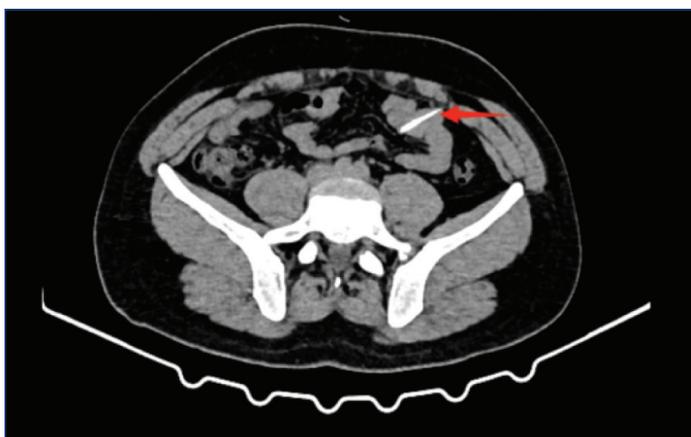
and vitals were stable. Patient was on antibiotics for three days after which he was discharged with analgesics. One week later on follow-up, the patient had no abdominal complaints. An ultrasound and X-ray abdomen were performed which were normal.



[Table/Fig-1]: Erect AP abdominal radiograph obtained 4 hours after ingestion demonstrates a slender linear radiopaque foreign body projected over the left lumbar region (red arrow), consistent with the swallowed dental file.



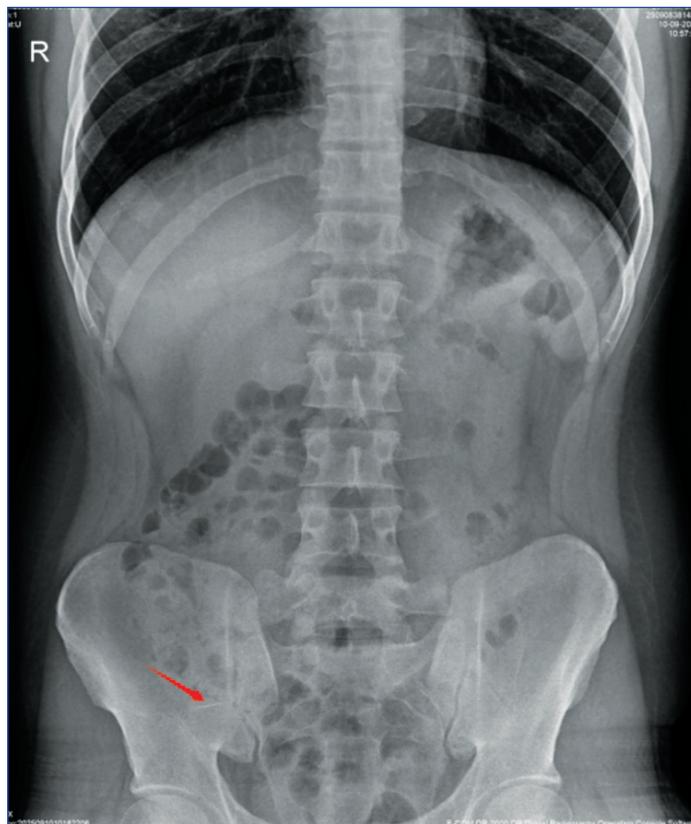
[Table/Fig-2]: Follow-up erect AP abdominal radiograph at 10 hours shows inferior migration of the same linear radiopaque foreign body within the left lumbar quadrant (red arrow), indicating slow intraluminal transit.



[Table/Fig-3]: Axial non-contrast CT of the abdomen (10 hours post ingestion) depicts an obliquely oriented hyperdense foreign body located within the lumen of the distal jejunum (red arrow), with no CT features of pneumoperitoneum or adjacent mesenteric inflammatory changes.



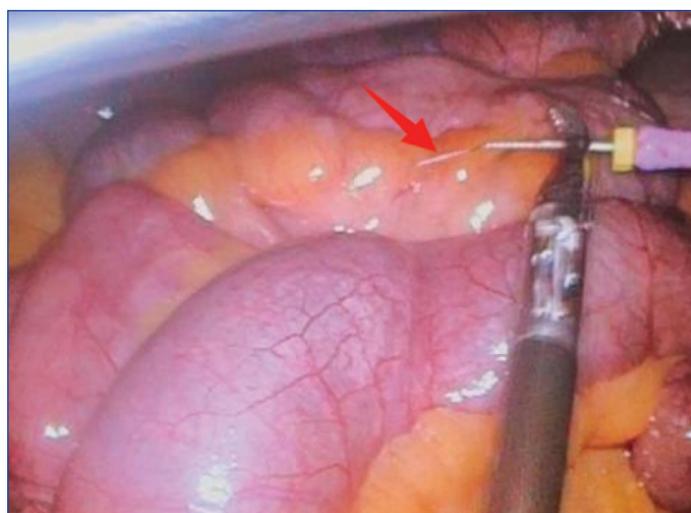
[Table/Fig-4]: Erect AP abdominal radiograph at 16 hours post ingestion reveals caudal progression of the linear radiopaque foreign body, now visualised in the pelvic region (red arrow).



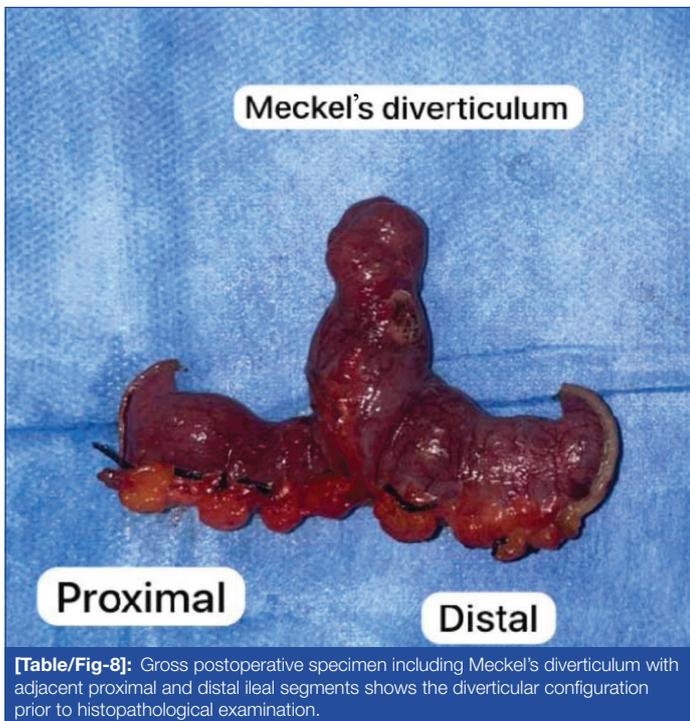
[Table/Fig-5]: Erect abdominal radiograph at 22 hours post-ingestion demonstrates persistent pelvic positioning of the radiopaque foreign body (red arrow), suggesting transient luminal impaction.



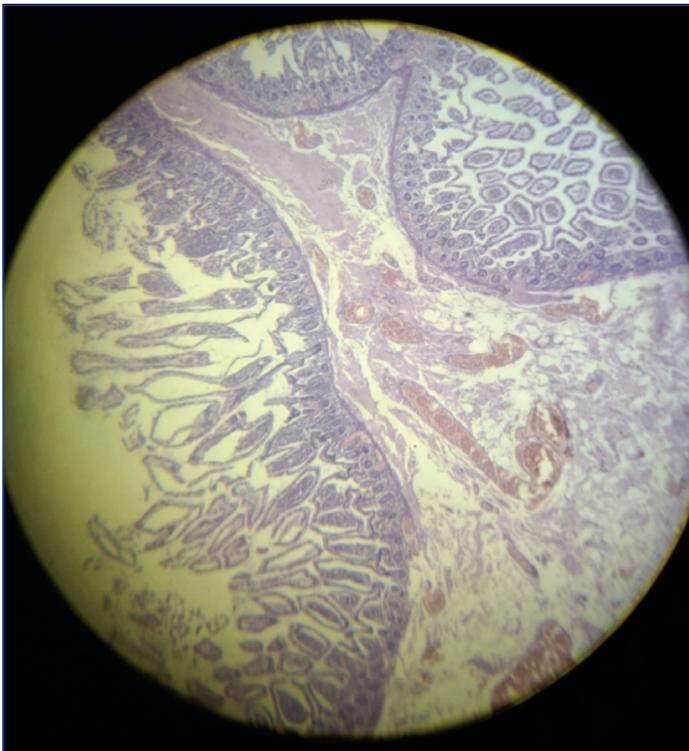
[Table/Fig-6]: a) Axial non-contrast CT abdomen (22 hours post ingestion) shows the hyperdense dental file piercing the antimesenteric wall of a diverticulum (red arrow), without intraperitoneal free air or free fluid; b) Coronal non-contrast CT abdomen (22 hours post ingestion) shows the hyperdense dental file within a diverticulum (yellow arrow) arising from the distal ileum. The proximal (red circle) and distal (green rectangle) ileal continuation of the diverticulum is also visualised.



[Table/Fig-7]: Intraoperative laparoscopic image reveals the metallic dental file penetrating the wall of the Meckel's diverticulum (red arrow), confirming the imaging suspicion of transmural perforation.



[Table/Fig-8]: Gross postoperative specimen including Meckel's diverticulum with adjacent proximal and distal ileal segments shows the diverticular configuration prior to histopathological examination.



[Table/Fig-9]: Histopathological section (H&E stain, original magnification X40) shows a true diverticulum containing all three layers of the intestinal wall. The lamina propria exhibits congestion and chronic inflammatory cell infiltration. The perforated site demonstrates extensive mucosal ulceration and haemorrhagic infarction. No ectopic mucosa or malignancy is identified.

DISCUSSION

The most common congenital anomaly of gastrointestinal tract is the Meckel's diverticulum, which occurs as a result of the failure of closure of the vitelline duct during embryonic development. It has a prevalence of about two percent [1,2]. Most of these cases are incidental and most often remain asymptomatic [3]. The diverticulum is by definition a veritable outpouching, which involves all the layers of the intestinal wall: mucosa, submucosa, and muscularis propria. It usually lies within 100 cm of ileocecal valve on antimesenteric side of the ileum [4]. Although they occur in both sexes, complications are more prevalent in males in a ratio of 2:1 [5]. The manifestation in children with Meckel's diverticulum is usually painless rectal bleeding that can be explained by the presence of ulcers in the ectopic gastric

mucosa [6]. Adults on the other hand tend to have obstruction, inflammation or uncommonly, perforation [7]. Perforation due to the ingestion of foreign bodies is very rare. Toothpicks, fish bones, or dental tools may get stuck in the diverticulum, causing inflammation and rupture [8].

The symptoms of a perforated Meckel's diverticulum are generally insidious or may mimic other acute abdominal conditions such as appendicitis or small-bowel perforation [5]. As a result, radiologic examination is crucial in diagnosis. Koller JJ et al., discussed a case where a fish bone had pierced the diverticulum, indicating the diagnostic challenge of non-discriminate pain in the abdominal area and the significance of cross-sectional imaging in determining the linear hyperdense entity in the ileum [9]. Likewise, Kadhi A et al., described perforation by a wooden tooth pick in a child, and stressed that sharp organic foreign bodies can escape early identification and even simulate acute appendicitis [10]. Another report that appeared in the international surgery journal explained how Meckel's diverticulum was perforated by an ingested sharp object, and restated the concept that preoperative diagnosis is difficult, and is often determined only during surgical exploration [11]. The perforation mechanism is believed to be comprised of pressure necrosis and focal inflammatory response at the site of impaction which eventually results in transmural injury. In this case, the dental file which is a metal object, small, sharp, and narrow, worked in the same fashion. Hard and sharp edge of the object was probably one of the reasons why it became trapped in the diverticulum and then permeated the wall. A dental file is a very unusual offending agent, unlike the widely reported items, like fish bones or toothpicks, which is why the case is unusual.

Serial plain radiographs to track the movement of the linear radiopaque object in this patient led to the suspicion of perforation and the use of advanced imaging. Plain films may occasionally detect foreign bodies or obstruction, but are rather unspecific. CT is the modality of the choice when acute abdominal conditions are to be examined in adults as it allows visualisation of anatomy and identification of blind-ending tubular structures, which are typical of Meckel's diverticulum. Radiologic manifestations like mural thickening, fat stranding or local perforation may be well visualised [8]. In this case CT was helpful in determining the course of the dental file between jejunum and ileum and in imaging perforation of the diverticular wall. Although not a regular investigation in the acute emergency setting, magnetic resonance imaging can provide further information in the paediatric or inconclusive cases. T2-weighted images can detect inflamed diverticular walls which appear hyperintense, while diffusion-weighted images can show diffusion restriction indicating ischaemia and infection [12]. Technetium-99m pertechnetate scintigraphy is useful in the diagnosis of ectopic gastric mucosa but does not have sensitivity in cases of perforated diverticula [13]. Ultrasonography, despite being operator-dependent and limited by bowel gas, may detect a non-compressible, blind-ending tubular structure with echogenic surrounding fat in inflammatory conditions [14]. The level of complications determines the surgical management. Asymptomatic incidental diverticula might not require intervention, whereas symptomatic or complicated diverticula usually require immediate surgical intervention. Only simple diverticulectomy is sufficient in non-complicated cases, but segmental bowel resection with ileo-ileal anastomosis is indicated in cases of perforation or possible ectopic mucosa [9]. In this case, the existence of the transmural dental file led to the decision of immediate resection. A report by Ding Y et al., confirmed the feasibility and safety of laparoscopic repair of perforated Meckel's diverticulum in adults with documentation of a positive outcome after laparoscopic surgery [15]. In line with these results, surgery was performed in this case leading to an event-free recovery. Early diagnosis and early surgical intervention lead to positive outcomes.

CONCLUSION(S)

This case highlights a complication of Meckel's diverticulum that is uncommon but serious induced by ingested dental file. Meckel's diverticulum is usually asymptomatic but may present acutely when complicated by impacted foreign bodies. It is characterised by a non-specific clinical presentation, making diagnosis challenging. Therefore, imaging plays an indispensable role in both detection and surgical planning.

Acknowledgement

The authors gratefully acknowledge the support of the Department of General Surgery and Department of Pathology for providing clinical and histopathological data for this case. We also thank the radiographers and technical team of Department of Radiology, SIMATS, for their consistent co-operation in ensuring high quality images.

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PLAGIARISM CHECKING METHODS: (Lain H et al.)

- Plagiarism X-checker: Jan 17, 2026
- Manual Googling: Feb 17, 2026
- iThenticate Software: Feb 21, 2026 (3%)

ETYMOLOGY: Author Origin

EMENDATIONS: 5

AUTHOR DECLARATION:

- Financial or Other Competing Interests: None
- Was informed consent obtained from the subjects involved in the study? Yes
- For any images presented appropriate consent has been obtained from the subjects. Yes

Date of Submission: **Jan 15, 2026**

Date of Peer Review: **Feb 01, 2026**

Date of Acceptance: **Feb 24, 2026**

Date of Publishing: **Apr 01, 2026**