



## Case report

## Surgical management of duodenal web in an adult presenting with melaena; Case report and literature review

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## ARTICLE INFO

## Keywords:

Duodenal web  
 Duodenal stenosis  
 Duodenal atresia  
 Duodenal diaphragm  
 Duodenotomy  
 Heineke-Mikulicz

## ABSTRACT

**Introduction:** Duodenal web is a rare pathology presenting infrequently in adults. Diagnosis is challenging and definitive management is commonly delayed. We present a case of a patient with a late diagnosis of duodenal web, who underwent laparotomy, intraoperative gastroscopy and surgical removal of the web performed by two general surgeons.

**Case presentation:** A 32-year-old woman with a previous diagnosis of irritable bowel syndrome presented with a three day history of abdominal pain, nausea and anorexia, and a one day history of melaena and haematemesis. Investigations including a magnetic resonance enterography, barium swallow study and gastroscopy revealed the diagnosis. The patient underwent laparotomy and excision of duodenal web. Intraoperative gastroscopy assisted with identification of the web's anatomical location. A longitudinal duodenotomy was performed and this was closed in a transverse fashion using the Heineke-Mikulicz technique.

**Discussion:** This case reports successful application of intraoperative gastroscopy during laparotomy and duodenotomy. Longitudinal duodenotomy with excision of the web and transverse closure of the duodenum appears to be the best approach. There are no previous publications detailing gastroscopy at the time of laparotomy with duodenal web. This technique may be utilised in appropriate situations to improve operative accuracy.

**Conclusion:** Duodenal web is a rare entity in adults, and delayed diagnosis may lead to significant patient morbidity. Incorporating intraoperative endoscopy ensures accurate anatomical visualisation. This technique avoids duodenectomy, organ damage, bypass, or an unnecessarily large incision.

## 1. Introduction

Duodenal web is a rare congenital defect that results from incomplete recanalisation of the duodenum between the sixth and eighth week of gestation [1]. A duodenal web is a membrane-like structure that partially obstructs the duodenum, composed of mucosa and submucosa, with an absent muscularis layer [2]. Patients with duodenal web develop obstructive symptoms shortly after birth, or less commonly by late childhood. The incidence of duodenal web is approximately one in 10,000 to one in 40,000 in children. Little is known about its prevalence in adults as it is often misdiagnosed [1]. Less than 80 cases have been described in the literature over the last 100 years [1].

Patients typically present with postprandial upper abdominal pain, nausea and abdominal distension [3]. There is a strong association between duodenal web and other congenital abnormalities, such as

Trisomy 21, annular pancreas, congenital heart disease and developmental delay [3–6]. Duodenal web is rarely diagnosed in adults, and may occur secondary to pancreatitis, ulceration, obstruction, non-steroidal anti-inflammatory drugs (NSAIDs) or abdominal surgery [1,7]. Diagnosis is frequently delayed as symptoms are non-specific, and visualisation of the web may be difficult on endoscopy. In the majority of cases a duodenal web may be completely removed or dilated by surgical or endoscopic intervention. This work has been reported in line with the SCARE and PROCESS criteria [8,9].

## 2. Case report

A 32-year-old woman was transferred acutely from a rural hospital to a tertiary centre with a one day history of haematemesis and melaena, and a three day history of abdominal pain, nausea and anorexia. The

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<https://doi.org/10.1016/j.ijscr.2021.106488>

Received 2 September 2021; Received in revised form 2 October 2021; Accepted 3 October 2021

Available online 6 October 2021

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patient had a nine year background history of nausea, abdominal pain, and diarrhoea. She had previously been diagnosed with irritable bowel syndrome, after an unremarkable gastroscopy and colonoscopy were performed several years earlier. At this time a coeliac antibody screen was performed and this was negative. The patient was re-referred to the gastroenterology service for ongoing gastroenterological symptoms but this had been declined several times due to previous normal investigations.

The patient's medical history included asthma, atopic dermatitis, migraines, anxiety and a previous hysterectomy for menorrhagia. Her regular medications included citalopram, fluticasone propionate, verapamil, salbutamol, loratadine, rizatriptan, cetomacrogol and hydrocortisone cream. She had a history of anaphylactic shock to fish, nuts and seafood. The patient was an independent woman who had three children, was a non-smoker and did not drink alcohol. The patient's family history included a maternal uncle with a history of Crohn's disease, and a maternal grandfather with a history of colorectal cancer.

At presentation, the patient was tachycardic with a heart rate of 109 beats per minute, a blood pressure of 126/70 mmHg, a respiratory rate of 20 breaths per minute and oxygen saturations of 100% on room air. Her abdomen was soft with epigastric tenderness, but no guarding or rigidity. Rectal examination revealed black stools suggestive of melaena. Her blood tests included a haemoglobin of 83 g per litre, lactate of 0.6 millimoles per litre, normal electrolytes and liver function tests, and a C-reactive protein of less than 10 mg per litre.

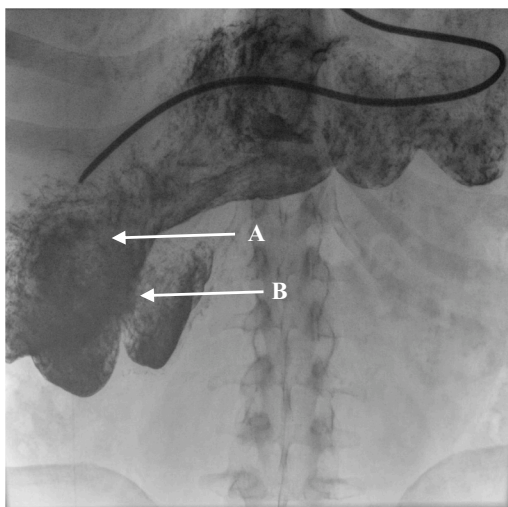
An urgent gastroscopy found a large volume of altered blood and food residue in the stomach, but the cause of bleeding was not seen. A repeat gastroscopy was performed the next day due to suboptimal views. This again revealed a large volume of food residue in the stomach and a dilated duodenum despite prolonged fasting, concerning for a proximal small bowel obstruction. Further outpatient investigations were arranged by a consultant gastroenterologist and the patient was discharged after a period of observation, once her symptoms had resolved.

A barium swallow study showed marked dilation of the stomach and proximal duodenum with a thin layer of barium within the lumen of D2, suggestive of a possible duodenal web (Fig. 1).

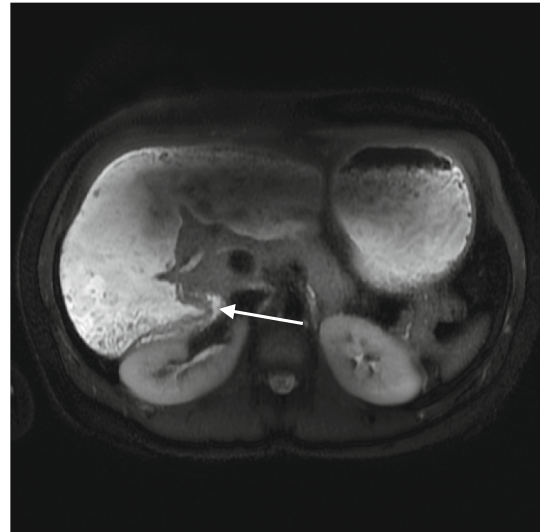
A small bowel magnetic resonance enterography demonstrated a dilated stomach and proximal duodenum with features suggestive of duodenal intussusception at the second part of the duodenum (D2) (Fig. 2).

Repeat gastroscopy revealed a concentric pinhole deformity in the distal duodenum, confirming the diagnosis (Fig. 3).

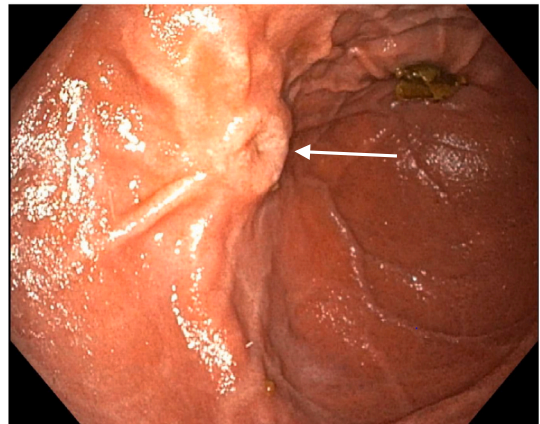
The patient proceeded for elective laparotomy and excision of



**Fig. 1.** Barium swallow study showing marked dilation of the stomach and proximal duodenum (arrow A) secondary to an obstructing phenomenon at D2 (arrow B).



**Fig. 2.** Magnetic resonance enterography demonstrating an outpouching at D2 suggestive of a possible duodenal intussusception (arrow).

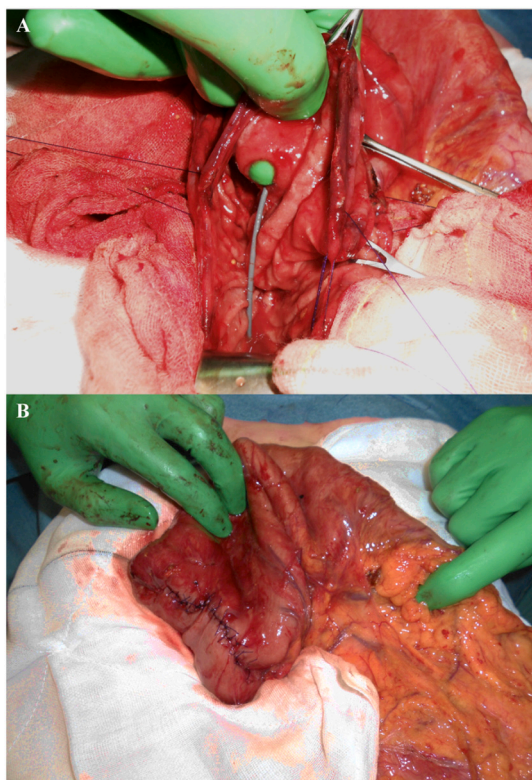


**Fig. 3.** Gastroscopy showing a severe narrowing concentric pinhole deformity in D3 (arrow), suspicious for a duodenal web.

duodenal web. A hepatobiliary surgeon and an upper gastrointestinal surgeon performed the operation with the assistance of a trainee general surgeon. A midline laparotomy incision was made. The dilated duodenum was Kocherised to optimise exposure. As the duodenal web was neither visible nor palpable after duodenal Kocherisation, the duodenojejunal flexure was mobilised in order to confirm the normal calibre of D3 and D4. While the abdomen was open, intraoperative gastroscopy was performed to identify the location of the 5 mm pinhole at the junction of D2 and D3. A guidewire was passed through the pinhole and a longitudinal duodenostomy, perpendicular to the web, was made at the anatomical level corresponding with the intraluminal views (Fig. 4).

The web was excised with a LigaSure™ device. A two-layered transverse closure of the duodenotomy in a Heineke-Mikulicz fashion was performed. Intraoperative completion gastroscopy confirmed luminal patency and no further distal lesion. A nasojejunal tube was placed intraoperatively and this was removed four days later, once the patient was tolerating an oral diet. The patient was discharged without complication seven days later.

A 92 × 80 × 10 mm segment of tissue was resected. Histology revealed the specimen to be microscopically representative of small bowel wall, consistent with the clinical scenario of origin from a duodenal web. No significant inflammation, evidence of other tissue



**Fig. 4.** A: Intraoperative findings of small calibre duodenal web, with glidewire passing through the narrowed duodenal lumen. B: Closure of chronically distended duodenum using Heineke-Mikulicz technique.

types or malignancy was seen.

The patient was followed up by the General Surgery and Gastroenterology service postoperatively. She recovered well, however had intermittent symptoms of gastric reflux and delayed gastric emptying, considered secondary to chronic distension of her stomach and duodenum. The patient was grateful to the surgical and gastroenterological teams for diagnosing and managing her issue. Dissatisfaction was expressed in regards to the long duration of time for the diagnosis to be made, and the multiple declined referrals from the Gastroenterology service. The patient understood the rarity of the diagnosis her diagnosis and subsequent challenge challenge in establishing this. She described no further episodes of melaena, abdominal pain or diarrhoea and made a full recovery.

### 3. Discussion

This case study reports the successful utilisation of intraoperative intraoperative gastroscopy during laparotomy. This technique enables an accurate duodenotomy incision and may prevent unnecessary damage to the duodenum or surrounding structures. The authors have not found any articles describing utilisation of endoscopy at the time of laparotomy for patients with duodenal web. This case report may be the first time that this has been documented in the literature.

Varied operative techniques have been described for the management of duodenal web, including gastrojejunostomy, duodenojejunostomy, and duodenotomy with web excision [1,3,5,6,10]. Authors in the last decade concur that a longitudinal incision, excision of the web and transverse closure of the duodenotomy is the optimal optimal approach [1,4,5,7,11,12]. In appropriate patients, minimally invasive techniques may avoid the need for laparotomy or duodenotomy, which can also result in complications [13]. Advances in endoscopy have enabled alternative minimally invasive approaches, such as dilatation and electrosurgical excision. These techniques have proven particularly popular

amongst the paediatric population, including the use of single incision paediatric endoscopic surgery (SIPES) and natural orifice transluminal endoscopic surgery (NOTES) [6,11–13]. Endoscopic ablation may result in scar formation and stenosis, requiring subsequent surgery [1,11].

Laparoscopic endoscopic cooperative surgery (LECS) is a hybrid technique that the authors considered. However, after taking into account the predicted difficulty in identifying the precise site of the web, preoperative uncertainty about feasible options for duodenal reconstruction and on account of gross distention of the duodenum, it was felt that an open approach would be safer. Given the rarity of the diagnosis, experience in endoscopic stenectomy was not available in the author's institution. Surgery was therefore determined to be the best option, considering the availability of local expertise.

The patient in this case was a fit and well woman with no preceding illness to suggest an acquired cause, and no congenital abnormalities. The principle clue provoking further investigation was excessive food residue at gastroscopy, despite prolonged fasting. The diagnosis was challenging given her prior history of negative endoscopy and misdiagnosis of irritable bowel syndrome. It is crucial to consider multimodal imaging in adults with an upper gastrointestinal dysmotility syndrome, as contrast studies and endoscopy provide detailed anatomical and functional information [1]. When a diagnosis of exclusion such as irritable bowel syndrome is challenged, it is critical to consider alternative causes, as was the case in this patient.

Intraoperative gastroscopy is an adjunct that is especially useful in limited surgery when when accurate localisation is critical. Few reports are available on the applications of intraoperative gastroscopy, but it may be useful in procedures such as pylorus-preserving gastrectomy, sleeve gastrectomy, or wedge resection [14]. The most common clinical application in the literature appears to be localisation of gastric tumours during laparoscopic gastrectomy [14,15]. Excision of duodenal web can cause damage to the biliary and pancreatic ducts as the duct may sometimes open directly into or adjacent to the web [5]. In this case, the entirety of the duodenum was dilated and distorted from chronic obstruction, and there was no clear extraluminal transition point. Obtaining an endoscopic view allowed a more definitive understanding of anatomical landmarks. The most concerning risks of gastroscopy include haemorrhage and perforation. However, in a controlled environment with an anaesthetised patient and an open abdomen, it is possible to identify and track the luminescent tip of the endoscope as it travels through the duodenum, thus providing more control and oversight to the surgeon and reducing the risk of patient harm.

Intraoperative gastroscopy requires two experienced general surgeons who are confident in endoscopy, or a consultant gastroenterologist, as well as a surgical assistant and a specialist endoscopy nurse. It would be optimal to equip theatre facilities for intraoperative intraoperative endoscopy. This is an underutilised adjunct that the authors recommend is used in an elective setting, assetting with appropriate staffing and adequate time set aside for the case.

### 4. Conclusion

Duodenal web is a rare yet persistent entity in adults, and delayed diagnosis confers significant patient morbidity. Our innovative hybrid method incorporating simultaneous endoscopy and surgical intervention has not been described in the literature before for duodenal web. The authors suggest a planned operative approach with one to two experienced surgeons, an endoscopist and a surgical assistant available. The utilisation of intraoperative intraoperative endoscopy ensures accurate intraluminal duodenal visualisation, therefore avoiding duodenectomy, ampullary or other organ damage, bypass, or an unnecessarily large duodenal incision.

### Funding

This research did not receive any specific grant from funding



agencies in the public, commercial, or not-for-profit sectors.

### Ethical approval

This paper did not require ethical approval as it is an observational report.

### Consent

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

### Research registration

Not applicable.

### Guarantor

Megan Grinlinton.

### Provenance and peer review

Not commissioned, externally peer-reviewed.

### CRediT authorship contribution statement

**Megan Grinlinton:** Data curation, Writing - Original draft preparation. **Wai Chang:** Conceptualization, Methodology. **Fraser Welsh:** Supervision, Writing - Reviewing and Editing. **Liz Phillips:** Visualization, Investigation.

### Declaration of competing interest

No conflict of interest.

### Acknowledgements

We would like to thank the patient for consenting to the publication of this case.

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