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Jagila M. Wesley
University of Tennessee Health Science Center, jminso@uthsc.edu

Stephanie Storgion
University of Tennessee Health Science Center, sstorgio@uthsc.edu

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A great mimicker: Upper respiratory infection, vomiting, irritability and strong smelling urine in an infant

Jagila M. Wesley
Stephanie Storgion
Division of Pediatric Critical Care, University of Tennessee Health Science Center/Le Bonheur Children’s Hospital, Memphis, TN, USA

Contact: Jagila M Wesley, UTHSC, 50 N. Dunlap Street, Suite 370R, Memphis, TN, 38103, USA. Email: jminso@uthsc.edu

Case Report
An 8-month-old male presented to the emergency department (ED) with vomiting following feeds for three days. The patient had been seen in the ED a day prior with symptoms consistent with upper respiratory infection - congestion, cough, rhinorrhea, and post-tussive emesis. On review of symptoms (ROS), pertinent negatives included lack of fever, normal stool consistency and frequency, adequate urine output (2-5 wet diapers), and normal activity level.

On exam, vital signs were abnormal, with elevated BP (112/77) and tachycardia (144bpm) thought to be secondary to agitation. The remainder of physical exam was otherwise unremarkable. RSV and Influenza screen were negative. Chest x-ray was normal, but abdominal x-ray /KUB (Figure 1) showed a moderate amount of stool throughout the colon not consistent with normal bowel movements as reported by the mother. The patient tolerated an oral challenge and on reassessment was found to be resting comfortably; repeat vitals were within normal range for age, and he was discharged home.

Figure 1: CR ABD COMP W DECUBITUS/ERECT VW
Reported Findings: the bowel gas pattern is normal with no evidence of obstruction or free air. A moderate amount of stool is noted throughout the colon. There is no mass effect or intra-abdominal calcification. The visualized lower lungs are clear. The osseous structures are within normal limits. Impression: moderate stool. Otherwise negative abdomen
The patient returned to the ED 24hrs later with continuing emesis which the mother described as milk-colored initially then later became green, aggravated by any attempted oral intake. The mother was concerned that the patient seemed more irritable, with strong smelling dark urine, and she was concerned the patient had belly pain. His physical exam was significant for diffuse abdominal tenderness on palpation. Chemistry panel demonstrated hyponatremic hypokalemic hypochloremic metabolic alkalosis (sodium 122mmol/L, potassium 2.3mmol/L, chloride <60mmol/L, serum bicarbonate 42mmol/L). Urinalysis showed 1+ urine ketones, with specific gravity 1.019. A venous blood gas confirmed purely metabolic alkalosis (7.65/46/52/51 BE >30). Abdominal ultrasonography revealed a partially visualized fluid-filled distal stomach and dilated fluid-filled proximal duodenum. An upper gastrointestinal series was interpreted as impressive for malrotation with completely obstructing midgut volvulus (Figure 2). The general surgery team was consulted, and the patient was taken emergently to the operating room for exploratory laparotomy.

Surgical Exploration: There was no evidence of volvulus or malrotation. There was a finding of significant dilation of the 1st, 2nd, and initial part of the 3rd portion of the duodenum with transition point identified distal to the ligament of Treitz. On further evaluation, a duodenal web with small aperture was appreciated at approximately the junction of the second and third portions of the duodenum. Due to bilious drainage from the area of the duodenal web, it was not resected, and a side-to-side lateral duodenoduodenostomy was performed.

Final Diagnosis:
Duodenal web with small aperture

Figure 2: CR GI UPPER W/O DELAYED FILMS W KUB
Reported Findings: The decompressed stomach was unremarkable, emptying into the duodenum readily. The proximal duodenum was markedly dilated. Beyond the dilated duodenal bulb, the bowel took an abrupt 180-degree turn with abrupt termination just to the right of midline in a caudally directed beak, the latter best seen at real-time imaging. Despite left lateral decubitus and prone positioning, no contrast propagated beyond this point. Impression: malrotation with completely obstructing midgut volvulus.
Hospital Course:
A Replogle tube was placed after surgery, and the patient had high output for two weeks post-operatively. The patient had no evidence of other anomalies associated with his underlying diagnosis, so no further work up was pursued. The patient was fed intravenously until enteral feeds could be achieved however his hospital course was complicated by PICC line infection for which he was initially treated with IV antibiotics and then completed his course with oral antibiotics. He was discharged home three weeks after admission to follow up in surgery clinic.

Extensive chart review revealed other pertinent positives include a prior medical history significant for vomiting since age six months when the patient's formula was changed from Good Start Gentle Early to Similac Advance per WIC provision. Additional nutritional history is also significant for improper mixing of formula: mother mixes 8oz water + 3 scoops Similac Advance + 2 shakes of cereal instead of 4 scoops for 8oz water. Also, the patient's social history is significant for an underage mother (16 years of age) who is currently expecting her second child. On thorough retrospective review of the chart it was noted the patient’s weight (6.8kg) on admission was <2nd percentile (z score -2.19, weight age ~3.5 months), length (69cm) was 10-25th percentile (z score -0.82), and head circumference (43cm) ~10th percentile (z score -1.29), with weight/length <2nd percentile (z score -2.38). This is consistent with moderate malnutrition. This history was not attained until after the patient was admitted.

Discussion:
A duodenal web or diaphragm refers to a complete or incomplete obstruction at the duodenum due to a membranous web or intraluminal diverticulum [1]. Duodenal web is an intrinsic cause of duodenal obstruction. It is reported to occur in one in 10,000 to 40,000 live births [2]. It is caused by failure of normal recanalization of the duodenum after epithelial cell occlusion of the foregut lumen in the 7-week human embryo [3] resulting in the persistence of a membrane. Duodenal webs have the tendency to occur in the second part of the duodenum and are associated with other congenital anomalies which are reported in more than 50% of affected patients [4]. A retrospective case series of 18 patients showed a delay in diagnosis was due to fenestrated membranes which presented past the neonatal age as partial obstruction or missed diagnosis in children with associated lower G.I. obstruction requiring surgical intervention [4]. We attribute the delayed presentation of our patient to be secondary to the small aperture noted within the duodenal web which allowed for adequate food passage for some time. The clinical presentation of affected patients includes intermittent, recurrent bilious vomiting, upper abdominal distension, and sometimes postprandial right upper abdominal pain [5], although most infants with duodenal obstruction do not have significant abdominal distension [6]. In patients diagnosed past the neonatal
Diagnosis is usually accomplished by an upper gastrointestinal series where a finding of “windsock sign” (figure 3) is pathognomonic for an intraluminal duodenal web [3,8]. On plain roentgenogram of the abdomen, a classic sign of duodenal obstruction of stenosis, “double bubble sign” (air-filled stomach and proximal duodenum), may be found and represents dilatation of the proximal duodenum and stomach and can be seen in both roentgenograms and ultrasound usually with severe obstruction [4,9,10]. Accompanying laboratory findings include metabolic derangements consistent with dehydration and metabolic alkalosis [6,11]. Differential diagnoses include other causes of intrinsic duodenal defect such as duodenal atresia, duodenal stenosis, duodenal duplication, an extrinsic defect such as pyloric web or atresia, annular pancreas or malrotation with congenital bands), or a combination of these. Preoperative treatment involves insertion of a naso- or orogastric sump tube to decompress the stomach, and adequate intravenous fluid resuscitation to correct hypovolemia and electrolyte abnormalities and to achieve hemodynamic stabilization [6,11]. Management of duodenal web involves surgical resection either via laparotomy or laparoscopic excision. However, endoscopic techniques show similar efficacy [9].

Conclusion
Our patient offers a presentation which required both medical and surgical intervention. Given our patient’s presentation with electrolyte disturbance and dehydration, his initial management should have included fluid resuscitation and
correction of electrolyte imbalance prior to surgical intervention. However, given
the radiologic interpretation of malrotation, he was emergently rushed to the OR
for emergent surgical instrumentation where a duodenal web with small aperture
was diagnosed. Review of the chart found the patient to have moderate
malnutrition which is more consistent with chronic illness and would have
modulated the immediate patient management. The case highlights the need for
thorough history and physical examination as well as review of pertinent
differentials in patients with such presentation. The possibility of a
duodenal web should be considered in any infant or child with persistent vomiting
and electrolyte disturbance when pyloric stenosis is excluded.

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