Abstract:
A 12-month-old female presented to the pediatric emergency department with constipation associated with urinary retention. This visit was one of several for constipation over the course of several weeks. She had been treated for functional constipation with dietary changes and an osmotic agent without relief and required one hospitalization for a bowel clean out. It was during her second admission, where she required frequent bladder catheterizations for urinary retention, that a diagnostic study was done which revealed the correct diagnosis.

Keywords:
constipation; urinary retention; sacrococcygeal teratoma; germ cell tumor; infant

Can't Poop, Can't Pee…What's Going On With Me?

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The patient is a 12-month-old Asian female who presents to the pediatric emergency department (ED) with a chief complaint of constipation. This was her fifth visit for constipation over a 6-week span. She was a full-term gestation and passed meconium on the first day of life. Past medical and surgical history were notable for bilateral polydactyly of the feet, which was repaired. There was no significant family history. Her only medication was polyethylene glycol, which was recently prescribed, and vaccinations were up to date for age. She lived with both parents, two aunts, and a 14-year-old brother. There were no pets or smokers in the home. Both parents worked in a restaurant.

On her initial visit to the ED, she presented with a subacute change from soft stools to small, hard stools, and had no bowel movements in the 3 days prior to the visit. She had recently changed from formula to cow's milk. She was drinking 18 to 19 ounces of cow's milk per day and little water; her diet otherwise consisted of soups, rice, vegetables, and peaches. She had a normal physical examination and was discharged to home on polyethylene glycol.

The patient returned to the ED 5 weeks later. She had been having hard, pellet-like bowel movements daily. Of concern for her mother, she had not had any urine output since the night prior to this visit. Her mother reported that the child's abdomen looked distended. She had not been taking the polyethylene glycol consistently since her prior visit. Review of systems was negative except as above.

Vital signs were normal for age. Her weight was in the 81st percentile for age and had not changed recently. On examination, the patient was well-appearing and well-nourished. She was in no

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apparent distress. Her abdomen was soft, nontender, and without distention, masses, or organomegaly. Bowel sounds were normal. A rectal exam revealed normal tone without any hemorrhoids or fissures. The genitourinary and skin exams were unremarkable; no sacral dimple or hair tuft was identified.

A bedside ultrasound examination was done to evaluate the bladder, which was found to be full of urine. Bladder catheterization elicited 170 mL of urine and she urinated more after the catheter was removed. A urinalysis was unremarkable. She also had a bowel movement in ED that was small, brown, and formed. The leading differential diagnosis was urinary retention secondary to constipation. She was discharged home with instructions on appropriate use of polyethylene glycol as well as dietary changes, including increasing water and decreasing milk intake.

The patient returned to the ED 12 hours later again with the chief complaint of constipation. Since discharge earlier that day, she had not produced any stool and had received part of a packet of polyethylene glycol. She was becoming increasingly fussy and straining to stool. She had one wet diaper with a very small amount of urine since discharge. Vital signs remained stable for age and her physical examination was unchanged. Bedside ultrasound examination again demonstrated a large amount of urine in the bladder. A saline enema was placed. After the enema, she urinated a small amount and had a 2 × 3 cm formed stool. Repeat bladder scan continued to show an enlarged bladder. Magnesium citrate was given, and an abdominal radiograph was obtained. The x-ray revealed a large to moderate formed stool burden throughout the colon. No free air was seen (Figures 1 A and B). Twenty milliliters of urine were obtained via bladder catheterization. Urinalysis demonstrated 1+ protein, trace leukocyte esterase, positive nitrites, large blood, many bacteria and one white blood cell (WBC). A urine culture was sent. The leading differential diagnosis was urinary retention from chronic constipation. The patient was admitted for bowel clean out and to monitor urine output.

While on the inpatient unit, she was started on a regimen of polyethylene glycol and lactulose. A bladder scan was done shortly after admission that revealed >400 mL urine. Another catheterization elicited 350 mL of urine that was sent for repeat analysis. Urinalysis was positive for nitrites, negative for leukocyte esterase, had many bacteria and no WBC. During her hospitalization, her stool output improved. Initially her bowel movements consisted of hard balls of stool that transitioned to liquid. She was voiding spontaneously at the time of discharge. Vital signs remained stable and she was discharged after 1 day of hospitalization. As she remained afebrile and the urine culture was pending, no antibiotics were initiated.

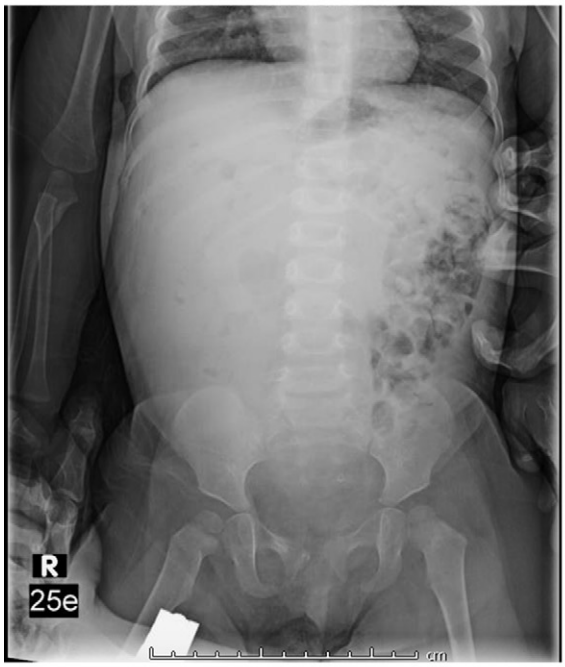
One day later, the urine culture came back positive for >100 000 CFU/mL *Escherichia coli*. Multiple attempts to call the family to start antibiotics were unsuccessful. Three days after hospital discharge, the patient presented to the ED with a chief complaint of abdominal pain. Since discharge from hospital, she had been taking her polyethylene glycol twice daily, but was still straining to have bowel movements. Her bowel movements were described, though, as soft and formed. On the day of presentation, she had one bowel movement with minimal urine output and an episode of severe fussiness and straining. Her mother felt that the child's abdomen was hard and distended. She denied the presence of fevers or vomiting. Vital signs were notable for a heart rate of 159, with remaining vital signs normal for age. Her weight remained the same as previously noted. Pertinent physical exam findings included an abdomen that was distended and dull to percussion. The child was crying and fussy during exam, making it difficult to assess for abdominal tenderness. Bowel sounds were normal. A straight catheterization elicited 600 mL urine resulting in improvement in her abdominal exam. Based on the urine culture results, she was started on cephalexin and discharged home.

Two days later, she again presented to the ED with chief complaint of constipation. Since her previous visit, she had been voiding normally until that morning. She had no stool output since discharge from the PED 2 days prior despite taking polyethylene glycol twice daily. Her mother denied any fevers, bloody stools, vomiting, diarrhea, or cough. She was eating at baseline. She had stopped giving her child whole milk and started a transitional formula.

Vital signs revealed a temperature of 36.6°C, pulse of 120/min, respirations of 28/min, oxygen saturation of 99% on room air, blood pressure 94/48 mmHg. Her physical examination revealed a clingy female but otherwise in no apparent distress. Abdominal examination was positive for distention. The remainder of the examination was unremarkable, although somewhat limited due to crying and clinginess to the mother.

Similar to prior visits, a formal abdominal ultrasound showed a significantly distended urinary bladder, mild hydronephrosis bilaterally with left greater than right pelvicalyceal dilatation. There was no evidence of nephrolithiasis. A few prominent lymph nodes were identified in the pelvis as well. A

a. AP abdominal radiograph.



b. Decubitus abdominal radiograph.

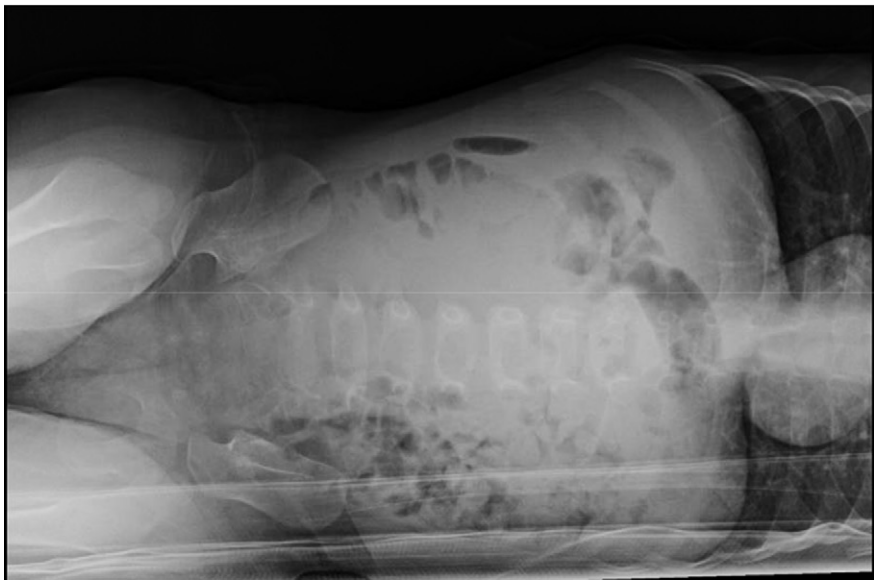


Figure 1. A, Anteroposterior abdominal radiograph. B, Decubitus abdominal radiograph.

Foley catheter was placed in the bladder for urinary retention, an enema was given for constipation, and she was admitted for further management.

Upon admission, she was started on polyethylene glycol through a nasogastric tube. Oral cephalexin was continued for her urinary tract infection (UTI). Urology recommended maintaining the Foley catheter for bladder decompression for several days, after which a voiding trial could be attempted. Stool output and abdominal exam improved over the first 2 days of hospitalization. The Foley catheter was then discontinued, but as she continued to have

difficulty voiding requiring replacement of the Foley catheter. It was at this point that the definitive diagnostic study was performed.

DIFFERENTIAL DIAGNOSIS

Constipation is a very common problem in children with an estimated prevalence of 0.7 to 29.6% worldwide.[1] The majority of cases are functional constipation, with less than 5% from an organic cause.[2] Childhood constipation has a significant impact on the use and costs of medical services owing to the fact that it is a burden on the quality of life for families, can be difficult to treat, and can require prolonged and multiple therapies.[3] This economic burden and negative impact on patients' lives make it extremely important to appropriately identify the correct etiology for a patient's constipation. Constipation should be considered as a symptom because the differential diagnoses are so extensive. A detailed history and physical examination are important to help exclude other diagnoses or complications of functional constipation.

Functional constipation (FC) must be a consideration for a patient presenting with difficulty stooling. FC presents as persistent difficulty stooling, or infrequent or seemingly incomplete defecation without an organic cause, often the result of voluntary withholding of stool by a child to avoid unpleasant and possibly painful defecation.[4,5] FC is diagnosed clinically and is defined using the "Rome IV" diagnostic criteria (Table 1).[6] There are 3 times during a child's life where FC is most commonly seen. The first is during infancy after introduction of solid foods. The second is associated with toilet training. The third is during the start of school.

Important historical findings for FC include symptoms that start after a few weeks to months of life, precipitating factors that coincide with the start of symptoms (e.g., change in diet, infections, timing of toilet training, starting daycare or school), and timely passage of meconium. Physical examination findings also play a major role in diagnosing FC. Examination should reveal a well-appearing patient, with normal growth parameters, normal appearance of the anus and surrounding area, a soft abdomen, normal appearance of skin and structures of lumbosacral and gluteal areas, and a normal gait, tone, strength, and reflexes of the lower limbs.[5]

The onset of the patient's constipation was associated with the introduction of cow's milk into her diet making cow's milk intolerance or protein allergy possibilities. A personal and family history of allergy and personal history of eczema can be present.[5] Constipation from dietary changes in general and possibly inadequate fluid intake can also exacerbate or bring on changes in stool consistency. There is inconsistent data about the role of cow's milk protein allergy in childhood constipation, but in the guideline study by Tabbers et al, a trial of hypoallergenic formula is recommended in those infants and toddlers who fail laxative treatment.[5,6]

Constipation in infants and young toddlers should also raise concern about possible mechanical obstruction or anatomic malformations. Examples of these types of pathologies are Hirschsprung disease (HD), an abdominal/pelvic mass, anal or rectal stenosis or achalasia. HD also known as congenital aganglionic megacolon, should always be considered in an infant with constipation. HD is caused by congenital absence of ganglion cells in the rectum and distal colon and produces spasm and abnormal motility of the affected segment.[7] This pattern leads to a distal intestinal segment that is contracted while the proximal segment is dilated with excess stool. Children with HD are typically symptomatic from birth and require assistance to stool, such as with enemas, suppositories, or manual stimulation. There may be a history of delayed meconium passage of more than 48 hours after birth and explosive stools after the withdrawal of a finger used for a rectal exam. Other symptoms and signs seen in HD are bloody diarrhea, abdominal distention, failure to thrive, signs of urinary obstruction, and an empty rectum on digital examination.[5] Other historical and examination findings that may suggest mechanical obstructions are ribbon-like stools, blood in stool without anal fissure, bilious

TABLE 1. Rome IV diagnostic criteria for functional constipation in infants and toddlers up to 4 years old.

Must include 1 month of at least 2 of the following:
1. 2 or fewer defecations per week
2. History of excessive stool retention
3. History of painful or hard bowel movements
4. History of large-diameter stools
5. Presence of a large fecal mass in the rectum
In toilet-trained children, the following additional criteria may be used:
6. At least 1 episode per week of incontinence after the acquisition of toileting skills
7. History of large-diameter stools that may obstruct the toilet

Data from: Benninga et al. Childhood functional gastrointestinal disorders: neonate/toddler.[6]

emesis, abnormal anal position, and tight anal canal on examination.[5,7]

In addition to abdominal or pelvic masses, sacral masses and other spinal cord abnormalities, such as trauma, sacral agenesis, or tethered cord, can also lead to constipation in young children.[5,7] Sacral masses can cause a mechanical obstruction, but like other spinal cord anomalies can cause neurologic impairment leading to constipation. Thus, a neurologic examination is very important to help identify these causes. Findings such as lower extremity weakness or decreased tone, locomotor delay, absent anal and cremasteric reflexes, or abnormal lower extremity reflexes can point to a spinal cord etiology. Physical examination may also reveal a sacral dimple, hair tuft, or gluteal cleft deviation.[5,7]

Another broad class of disorders that can lead to childhood constipation are metabolic disturbances. These include hypothyroidism, hyperparathyroidism, diabetes mellitus, diabetes insipidus, renal tubular acidosis, and some electrolyte abnormalities such as hypercalcemia and hypokalemia.[7] A good personal and family history and laboratory testing can help exclude these diagnoses. A history of growth and developmental delay and a strong family history may suggest hypothyroidism.[5] Other symptoms of hypothyroidism include fatigue, somnolence, peripheral edema, and hypothermia.[7] Examination of the thyroid is important to evaluate for goiter or masses. Constipation from disorders such as diabetes insipidus and renal tubular acidosis is secondary to water loss.[7] Increased serum calcium, from hyperparathyroidism for example, causes constipation through decreased peristalsis.[7]

Hypercalcemia and subsequent constipation can be from vitamin D intoxication as well and is an example that various drugs and toxins can lead to constipation. Other drugs that can cause constipation include opiates, antidepressants, iron, and anticholinergics. Heavy metals, such as lead, should also be considered in children with constipation.[5,7] A thorough family and social history can raise suspicion for exposure to these types of medications or toxins.

Cystic fibrosis should be considered in patients with difficult to treat constipation. While typical presentations include frequent respiratory infections and pulmonary complaints, failure to thrive, and pancreatic insufficiency, constipation alone can be an atypical presentation.[7]

One final consideration is infant botulism. This rare illness is caused by ingestion of spores of *Clostridium botulinum* that release neurotoxins. The presentation can be acute or more gradual and is most common in children less than 6 months of age.[7] The typical infant with botulism presents with lethargy, a weak cry, poor feeding, poor latching, and dehydration. A history of exposure to honey, a recent feeding change, living in a rural environment or close to a construction site can clue clinicians in to the diagnosis. On examination, infants are typically hypotonic and hyporeflexic. Bulbar muscle weakness may lead to increased secretions. A facial droop, ophthalmoplegia, and a decreased gag reflex may be present.

CASE PROGRESSION AND DIAGNOSIS

Magnetic resonance imaging (MRI) of the total spine was performed that revealed a 6.6 × 6.2 × 8.5 cm heterogeneously enhancing solid and cystic mass centered within the presacral and precoccygeal pelvis concerning for a sacrococcygeal teratoma (Figure 2). There was invasion and involvement of the sacral spine, sacral neural foramina, and caudal sacral epidural space. No metastases were identified.

The patient was transferred to the oncology service for further workup and neurosurgery was consulted. An alpha-feto protein (AFP) was sent that was very elevated (54 757 ng/mL). She underwent an MRI of the abdomen and pelvis that did not reveal any metastases. She then underwent a surgical biopsy of the mass that was identified as a yolk sac tumor. Chemotherapy was initiated, which she tolerated well without any significant complications. Repeat imaging after several rounds of chemotherapy showed a significant decrease in the size of the mass and a vast improvement in her AFP level. She underwent resection of the mass and is now in remission. Her urinary retention and constipation have resolved.

CASE DISCUSSION

This case raises many good discussion points, but two in particular are: (1) understanding the basic epidemiology, pathophysiology, clinical presentation, diagnosis, and treatment options for sacrococcygeal teratomas (SCT) in children; and (2) recognizing "red flag" or alarming signs and symptoms that may suggest an organic cause for constipation in children.

SCT are the most common childhood germ cell tumors (GCT), accounting for 40% of all GCT.[8] SCT are one of many extragonadal GCT (other locations include the central nervous system, retroperitoneum, head and neck, and mediastinum) and have an approximately 4:1 female-to-male predominance.[8-10] Malignant elements are present in up to 35% of cases and are directly related to age at presentation.[8-10]

SCT contain tissue derived from all three germ cell layers (endoderm, ectoderm, and mesoderm) and can have solid, cystic or mixed components.[8,11]

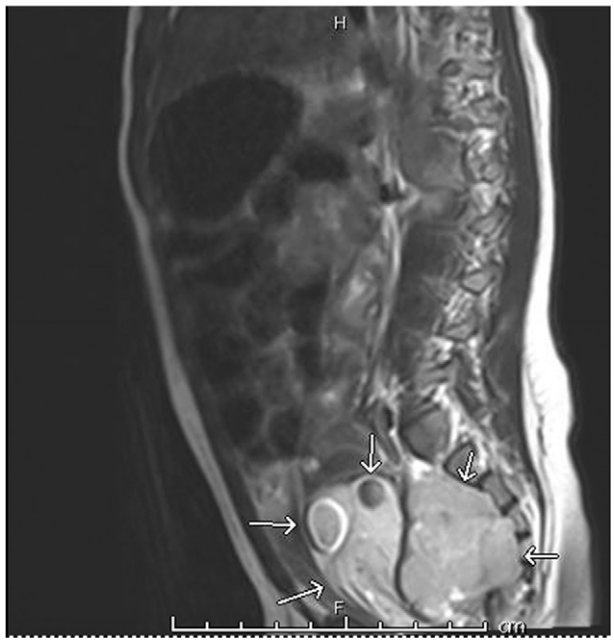


Figure 2. Sagittal section of MRI.

The majority of SCT are diagnosed prenatally with ultrasound but can be identified at birth or in infancy as well.[8,10] For SCT diagnosed postnatally, patients can be asymptomatic, have signs of bladder or rectum obstruction, or have lower extremity weakness, pain or paralysis.[8]

The diagnosis of a SCT involves imaging studies and laboratory analysis of tumor markers. Two imaging studies that play an essential role in the diagnosis of SCT are ultrasound and MRI. Ultrasound is particularly useful for in-utero cases. MRI is used both prenatally and antenatally.[12,13] Two important laboratory markers are AFP and beta-human chorionic gonadotropin (-hCG). AFP is elevated with yolk sac tumors and can be serially monitored during treatment to assess response.[14] -hCG is produced by all choriocarcinomas, some germinomas and embryonal carcinomas.[12] Biopsy and/or surgical resection of the tumor will provide the definitive diagnosis.

GCT in general and SCT in particular are very heterogeneous, so treatment depends on histology, age, and site. In most cases, surgical resection is the treatment of choice and typically undertaken postnatally. Surgical resection followed by careful monitoring for disease recurrence is recommended for mature (benign) and immature (mixed) SCT.[9,10,15] For malignant SCT, there are generally two options for treatment. One option is initial surgical resection followed by platinum-based chemotherapy. The other option is diagnostic tumor biopsy and pre-operative platinum-based chemotherapy, followed by tumor resection.[15,16]

The prognosis for the majority of SCT is favorable, but depends on classification and stage of the tumor, as well as patient age at diagnosis. Diagnosis at greater than 2 months of age is a risk factor for malignancy.[12] Incomplete resections and immature or malignant histology of SCT have been shown to have a higher rate of recurrence.[16-18] However, even for lower stage malignant SCT treated with complete surgical resection and chemotherapy, the overall survival at 5-years is greater than 90%.[12,15,17] Event-free survival and overall survival is much lower for patients with metastatic disease.[16]

As mentioned previously, a thorough and detailed history and physical examination will help to differentiate functional constipation from an organic etiology of constipation. Table 2 lists red flag and alarming historical and examination findings that suggest the presence of an underlying disease leading to constipation. Our patient did have blood in her stools in the absence of anal fissures as well as urinary retention.

SUMMARY

Constipation is a frequent complaint in pediatric patients, especially in the ED. While the vast majority of constipation in children is functional, it is essential for providers to assess for an organic etiology. The history and physical examination can

TABLE 2 Alarming signs and symptoms in constipation

Constipation starting extremely early in life (<1 month)
Passage of meconium >48 hours after birth
Family history of Hirschsprung disease
Ribbon stools
Blood in the stools in the absence of anal fissures
Failure to thrive
Fever
Bilious vomiting
Abnormal thyroid gland
Severe abdominal distention
Perianal fistula
Abnormal position of anus
Absent anal or cremasteric reflex
Decreased lower extremity strength/tone/reflex
Tuft of hair on spine
Sacral dimple
Gluteal cleft deviation
Extreme fear during anal inspection
Anal scars
Urinary incontinence or bladder disease

Data from: Tabbers MM, et al. Evaluation and treatment of functional constipation in infants and children: evidence-based recommendations from ESPGHAN and NASPGHAN.[5]

provide important clues as to the etiology of constipation, in order that appropriate therapy may be initiated, and complications can be avoided.

CONFLICTS OF INTEREST

None of the authors has any commercial, financial or other relevant relationships to disclose

AUTHOR CONTRIBUTIONS

SMW and MLL conceived and designed the case report, drafted the manuscript, and contributed substantially to its revision and subsequent final version. SMW takes responsibility for the paper as a whole.

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