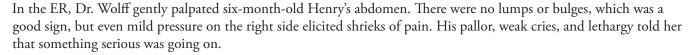# Blood in Henry's Diaper:
When Gastric Mucosa Is in the Wrong Place

by

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In the ER, Dr. Wolff gently palpated six-month-old Henry's abdomen. There were no lumps or bulges, which was a good sign, but even mild pressure on the right side elicited shrieks of pain. His pallor, weak cries, and lethargy told her that something serious was going on.

Alison and Nathan watched as Dr. Wolff examined their son. Alison explained that Henry had produced reddish-colored stools for the last day or two after eating pureed red beets. This morning, Nathan found his diaper was full of blood.

Dr. Wolff loosened Henry's diaper and observed a small amount of stool mixed with copious amounts of bright red blood and mucus.

"Hmm, that must have been quite a shock to see. This is what we call currant jelly stool," she explained. "It's a sign that there's bleeding and irritation somewhere in Henry's lower digestive tract."

Dr. Wolff placed her stethoscope on Henry's abdomen and listened carefully. "His bowel sounds are normal and since he hasn't been vomiting, I don't think he has an obstruction or blockage. He doesn't have the classic signs of appendicitis either. I'm going to order some X-rays and an ultrasound of Henry's abdomen, which will help us figure out what's going on. In the meantime, we'll give him a blood transfusion to minimize the effects of his blood loss."

Several hours later, Alison and Nathan listened carefully as Dr. Wolff provided an update.

"The X-rays and ultrasound ruled out some conditions that can cause GI bleeding, so I think it's quite possible that Henry has a Meckel's diverticulum. That's a small pouch attached to the small intestine which can secrete acid that damages the lining of the small intestine. We need to do a special test called a Meckel scan, which involves injecting a tracer that is taken up by cells often found in the diverticulum and detected with special scans."

Henry was quickly given a dose of famotidine, followed by the tracer. In the imaging suite, the scans clearly showed the tracer collecting in a defined location just to the right of the abdominal midline, confirming Dr. Wolff's suspicions.

Later that evening, Alison and Nathan were relieved when the pediatric surgeon entered the waiting room and gave them some good news. "We successfully removed the diverticulum from Henry's ileum. The small intestine looked inflamed and ulcerated where the diverticulum was attached, so we also removed a small segment of that. But he is doing well and you can go see him once he's out of recovery."

Several days later, a hospital pediatrician came to examine Henry before discharging him. "Here's a copy of the pathology report on the tissue removed from Henry. It confirms that his diverticulum contained fully developed gastric mucosa capable of secreting stomach acid. The acid eroded the lining of the small intestine which led to Henry's pain and bleeding."

Noticing Alison and Nathan's blank stares, the pediatrician smiled. "Sorry for the medical-speak. In other words, Henry is fine and you shouldn't see any more blood in his diapers. Continue the gradual return to solid food and call us if you have any questions. You can take him home now."

Questions

1. What were the symptoms that caused Henry's parents to bring him to the ER? What additional observations did Dr. Wolff make on her first exam of Henry?

2. Where is the anatomical division between the upper and lower GI tract? What organs are in each division?

3. What could vomiting indicate about the location of the issue in Henry's GI tract?

4. How did Dr. Wolff deduce that the bleeding was probably occurring in the lower GI tract based on its color in Henry's diaper? Use the terms *melena* and *hematochezia* in your answer and explain why the appearance of blood in stool is different in each condition.

5. Dr. Wolff heard normal "bowel sounds" when she listened to Henry's abdomen.

   a) What are bowel sounds and how are they related to peristalsis?

   b) Name and describe the layer of the GI wall that is primarily responsible for peristalsis. Describe the neural control of this layer.

   c) Suppose that Henry did have a blockage (small bowel obstruction). Predict what Dr. Wolff would have heard with her stethoscope.

6. Henry's X-rays and ultrasound ruled out the presence of volvulus, which occurs when a portion of the small intestine and its mesentery gets twisted. The twisting (or torsion) cuts off blood supply and the damaged tissue can produce bleeding.

   a) Explain the relationship of the mesentery with the parietal and visceral peritoneum. What is the purpose of the mesentery?

   b) Why is torsion that involves the mesentery likely to impair blood flow to or from the affected segment of the small intestine? Your answer should include specific vessels.

c) If the disruption of blood flow is significant, how might blood flow in the hepatic portal vein be altered?

7. Even though Meckel's diverticulum is attached to the ileum, it frequently contains gastric mucosa. Henry's diverticulum was rather unusual because it contained a large amount of gastric mucosa with numerous and well-differentiated cells. Describe the functions of these cells:

a) Parietal cells:

b) Chief cells:

c) Foveolar cells:

8. Prior to his scan, Henry was given a dose of famotidine to enhance the detection of the tracer (even though no one knows exactly why this works). Famotidine is a common treatment for gastroesophageal reflux (when acid escapes from the stomach into the esophagus).

a) How are histamine H2 receptors related to stomach acid secretion?

b) Famotidine is a histamine H2 receptor antagonist. What effect did the famotidine Henry was given have on acid production?

9. The acid produced by the gastric mucosa in the Meckel's diverticulum was secreted into Henry's ileum and eroded the lining deeply enough to cause significant bleeding. Explain why the same acid produced by gastric mucosa in the stomach doesn't typically cause erosion of the stomach wall.

10. Due to its embryonic origin, Meckel's diverticulum is located on the ileum. Suppose it was possible for Henry's diverticulum to be attached to the duodenum instead.

a) Predict changes in the appearance of blood in Henry's diaper.

b) Do you think Henry's bleeding would have been as severe? Why or why not?