

A 4-week-old full-term boy is brought to the emergency department with persistent, forceful vomiting immediately after feeds for the past several days. The vomitus is always nonbloody and nonbilious. Vital signs show tachycardia, hypotension, and bradypnea. Examination shows a thin infant with a sunken anterior fontanel and dry mucous membranes. His abdomen is soft, nontender, and nondistended. An olive-shaped mass is palpated in the right upper quadrant. Which of the following laboratory findings would be expected in this patient?

pH PaCO₂ HCO₃ K Cl

- ☐ A. ↓ ↓ ↓ ↓ ↓
- ☐ B. ↓ ↑ ↑ Normal Normal
- ☐ C. Normal Normal Normal Normal Normal
- ☐ D. ↑ ↑ ↑ ↓ ↓
- ☐ E. ↑ ↑ ↑ ↑ ↑

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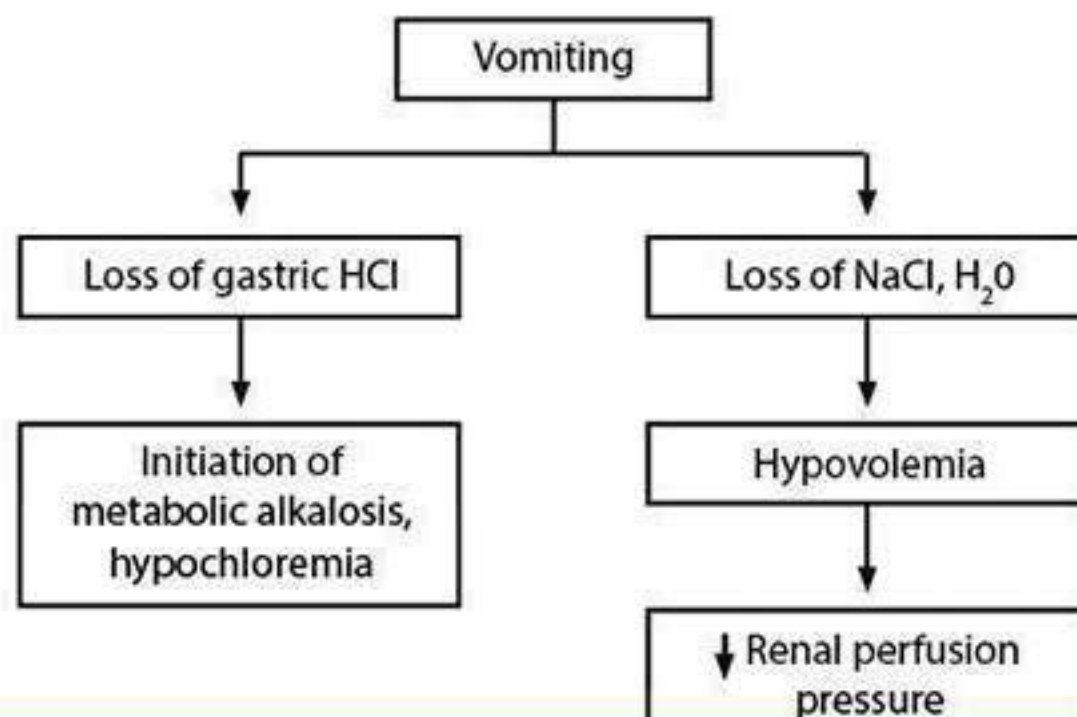
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|-------------------------------------|--------|--------|--------|--------|--------|-------|
| <input type="radio"/> A. | ↓ | ↓ | ↓ | ↓ | ↓ | [6%] |
| <input type="radio"/> B. | ↓ | ↑ | ↑ | Normal | Normal | [1%] |
| <input type="radio"/> C. | Normal | Normal | Normal | Normal | Normal | [0%] |
| <input checked="" type="radio"/> D. | ↑ | ↑ | ↑ | ↓ | ↓ | [91%] |
| <input type="radio"/> E. | ↑ | ↑ | ↑ | ↑ | ↑ | [2%] |

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Explanation:

User Id: [redacted]

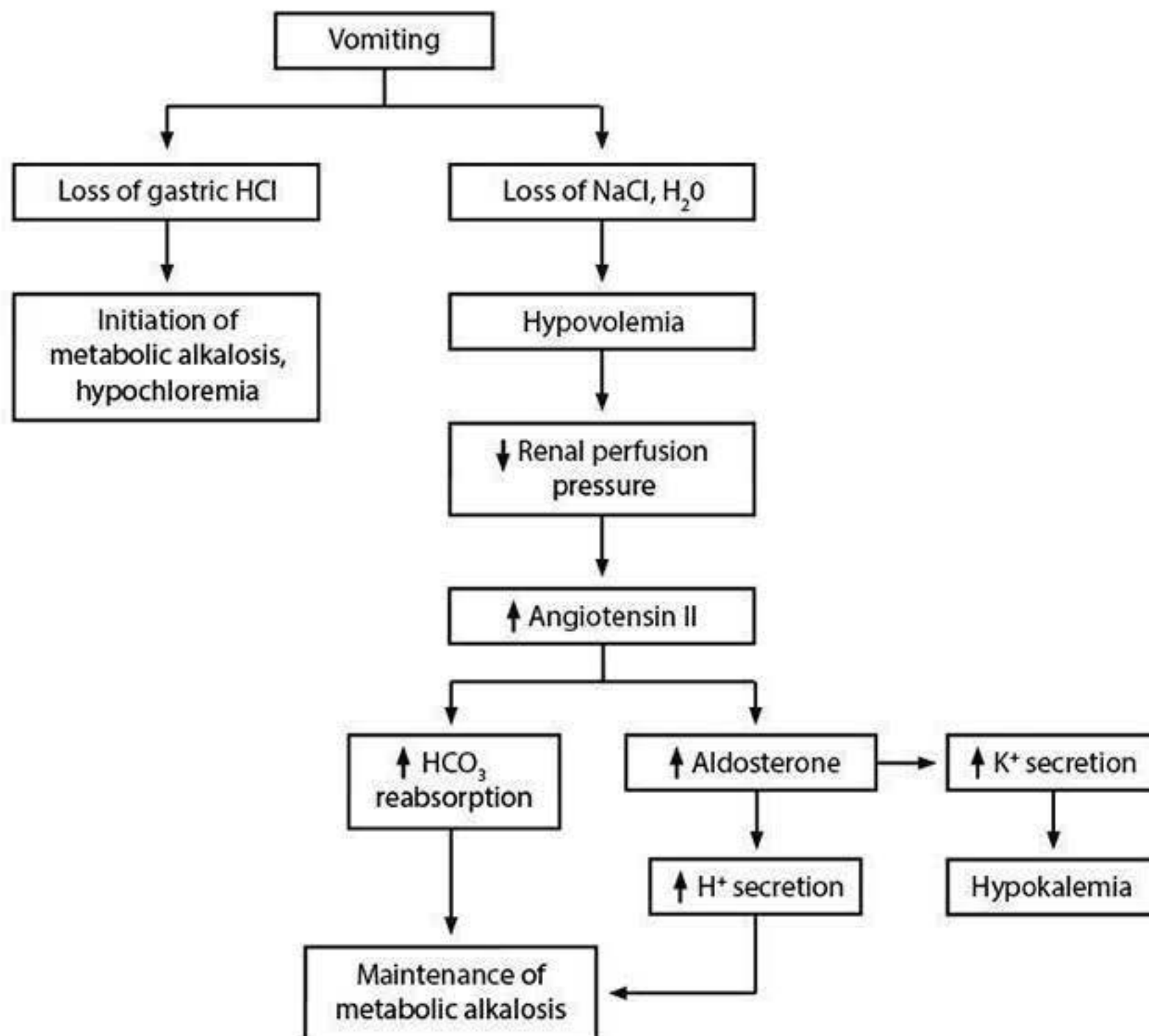
Laboratory derangements in pyloric stenosis



Explanation:

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Laboratory derangements in pyloric stenosis



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This infant's history and physical examination are consistent with infantile hypertrophic pyloric stenosis. This condition typically presents in **first-born boys age 3-5 weeks**.

The hypertrophied pylorus muscle obstructs the gastric outlet, resulting in **projectile, nonbilious emesis** and an **olive-shaped abdominal mass**. Diagnosis is confirmed by **abdominal ultrasonography**, which shows a **thick, elongated pylorus**.

If diagnosis is delayed, protracted vomiting can result in **hypochloremic, hypokalemic metabolic alkalosis** (diagram). Normally, gastric acid enters the duodenum and stimulates pancreatic secretion of bicarbonate. In pyloric stenosis, hydrochloric acid is



Maintenance of
metabolic alkalosis

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If diagnosis is delayed, protracted vomiting can result in **hypochloremic, hypokalemic metabolic alkalosis** (diagram). Normally, gastric acid enters the duodenum and stimulates pancreatic secretion of bicarbonate. In pyloric stenosis, hydrochloric acid is lost in the emesis and cannot enter the duodenum to stimulate pancreatic bicarbonate secretion. Dehydration and hypovolemia also cause contraction alkalosis. Hypovolemia activates the renin-angiotensin-aldosterone system in attempt to retain water at the expense of hydrogen ions. Some potassium is also lost in the emesis, and hypokalemia is exacerbated as the kidneys secrete potassium in response to aldosterone. The respiratory system responds with compensatory hypoventilation, resulting in secondary respiratory acidosis.

Pyloromyotomy is the treatment of choice. However, prior to surgery, laboratory derangements should be normalized with intravenous rehydration as alkalosis increases risk of **postoperative apnea**.

(Choice A) Primary metabolic acidosis is characterized by decreased pH, PaCO_2 , and bicarbonate. Metabolic acidosis can occur when vomiting is accompanied by diarrhea as significant amounts of bicarbonate are lost in the stool. Potassium and chloride are also lost in diarrhea.

(Choice B) Primary respiratory acidosis is characterized by decreased pH with elevated PaCO_2 and bicarbonate. This occurs in respiratory depression (eg, narcotic overdose) and hypoventilation syndromes (eg, neuromuscular disease). However, the PaCO_2 retention in pyloric stenosis is secondary to the primary metabolic alkalosis disturbance.

(Choice C) A normal acid-base status is characterized by pH of 7.35-7.45, PaCO_2 of 35-45 mm Hg, and bicarbonate of 22-26 mEq/L. Normal laboratory values are unlikely in this patient with prolonged vomiting, dehydration, and abnormal vital signs.

(Choice E) Hyperkalemia and hyperchloremia are not seen in pyloric stenosis.

Educational objective:

Pyloric stenosis presents at age 3-5 weeks with **projectile, nonbilious vomiting** that

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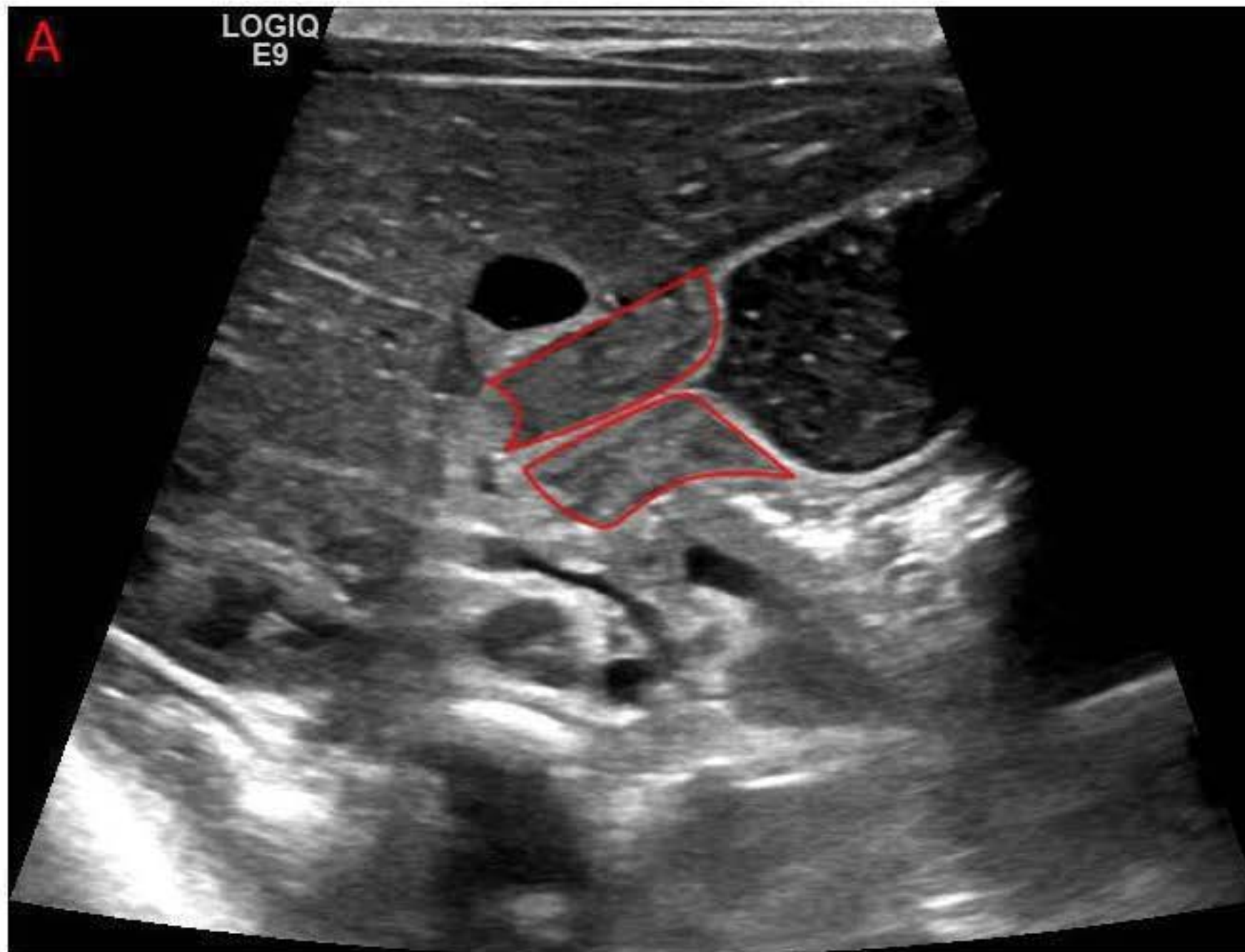
Pyloric stenosis presents at age 3-5 weeks with **projectile, nonbilious vomiting** that occurs after each feed. Protracted vomiting produces a **hypochloremic, hypokalemic metabolic alkalosis** that should be corrected prior to pyloromyotomy.

References:

1. [Infantile hypertrophic pyloric stenosis.](#)
2. [Electrolyte profile of pediatric patients with hypertrophic pyloric stenosis.](#)

Media Exhibit

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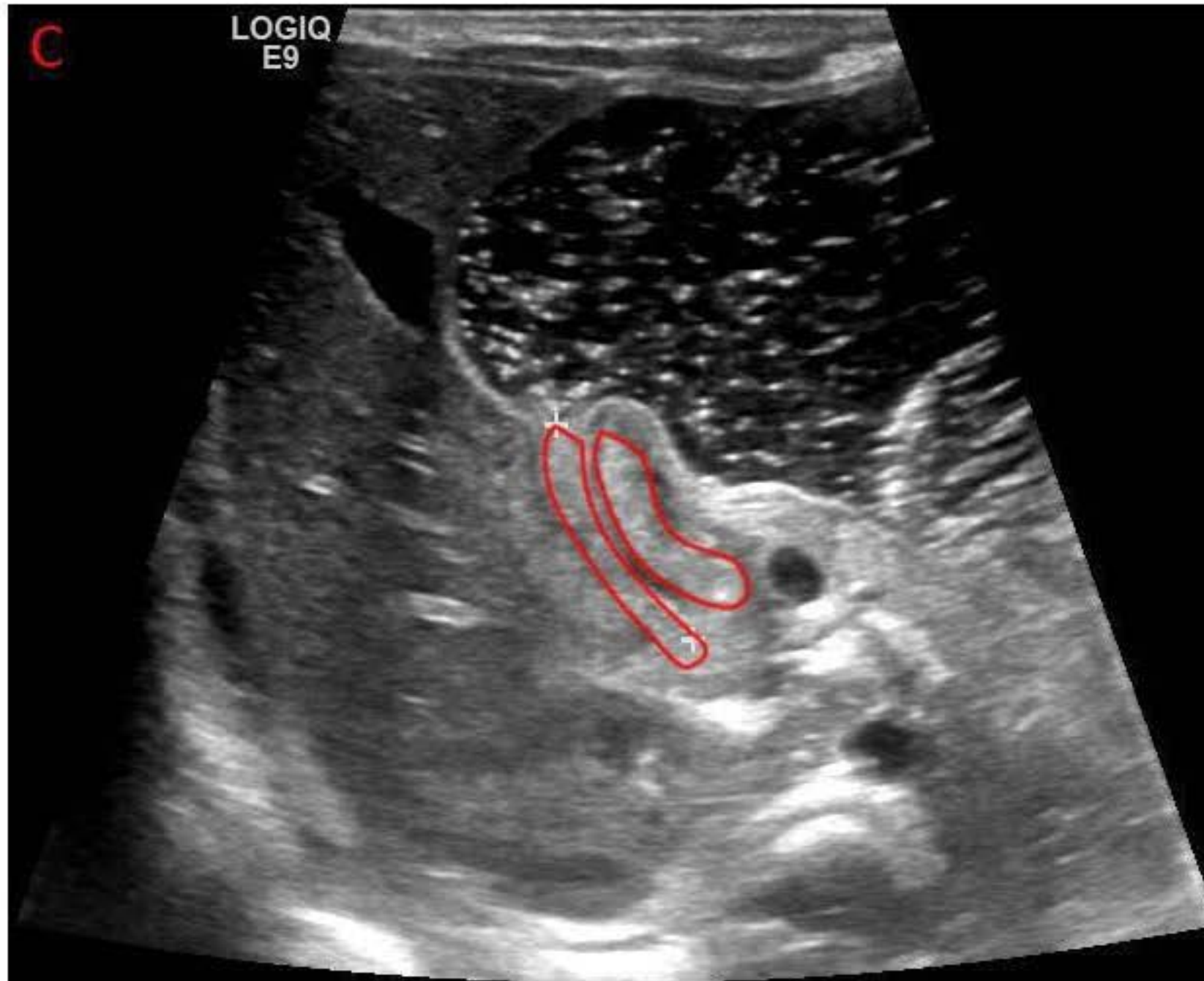
Media Exhibit

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