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Letter to the Editor
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Inadvertent Intravenous Administration of an Oral Alginate-antacid Suspension: A Wrong-route Medication Error and Strategies for Prevention

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Dear Editor,

Medication administration errors are among the leading causes of hospital-acquired adverse events, and the intravenous (IV) route carries the highest risk among such errors (1). Although the inadvertent IV administration of preparations intended for the oral or enteral route is classified as a "never event," it continues to be reported in practice; the Pennsylvania Patient Safety Authority has documented cases of serious harm, including one death, attributable to such errors (2). Wrong-route events have been reported following administration of other oral or enteral liquids, including simethicone, which precipitated respiratory distress and cyanosis (3), enteral feeds, and breast milk, which have been associated with microembolism, coagulation activation, and even death (4). To the best of our knowledge, however, no case involving an oral alginate–antacid suspension has previously been reported. We present what we believe to be the first reported case, observed in our emergency department, of inadvertent IV push administration of an oral alginate–antacid suspension containing sodium alginate, sodium bicarbonate, and calcium carbonate.

A 34-year-old man with no known chronic illness presented to the emergency department with heartburn and dizziness accompanying symptoms of an upper respiratory tract infection that had begun one day earlier. He was in good general condition with stable vital signs: blood pressure 115/85 mmHg, heart rate 75 beats/min, oxygen saturation 98% on room air, and temperature 37.5 °C. The ordered treatment consisted of IV paracetamol, an IV esomeprazole push, and an oral alginate-antacid suspension (Gasvin, Deva Holding, İstanbul, Türkiye; sodium alginate 500 mg, sodium bicarbonate 267 mg, and calcium carbonate 160 mg per 10 mL). The product's Summary of Product Characteristics reports neither the pH nor the osmolarity of this oral preparation (5). The oral suspension was drawn up into a parenteral (Luer) syringe and handed to a trainee nurse for administration without the intended oral route being communicated. Assuming that a filled syringe implied IV use, the trainee administered 10 mL of the suspension by IV push. The error was recognized promptly by the nursing staff and the patient's relative, who noted that the medication was normally taken by mouth. The patient was immediately moved to the resuscitation area, the attending physician was notified, and serial electrocardiography (ECG) monitoring was initiated. Apart from a transient, self-limiting ecchymosis at the injection site, no systemic findings were observed in the early period, and the ECG showed a normal sinus rhythm. The National Poison Information Center was consulted and recommended follow-up by toxicology and intensive care, with possible hemodialysis.

Immediately after the event, the patient was hemodynamically stable and asymptomatic apart from an injection-site ecchymosis; serial monitoring at 90 minutes showed stable vital signs (blood pressure 125/80 mmHg, pulse 108 beats/min, temperature 36.5 °C). Arterial blood gas and routine laboratory parameters—including complete blood count, biochemistry, cardiac enzymes, lactate dehydrogenase, D-dimer, and the coagulation profile

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(PT/aPTT/INR)—were within normal limits. A chest radiograph demonstrated no acute cardiopulmonary abnormality. Contrast-enhanced computed tomography, initially considered to evaluate iatrogenic pulmonary microembolism, was deferred owing to concerns about the additional hemodynamic and renal burden of contrast media; no alternative cross-sectional imaging was performed. The patient was transferred to the toxicology intensive care unit of a tertiary urban hospital for further follow-up care.

On admission to intensive care, new symptoms that were not present initially were recorded (back pain, aural burning, and bilateral leg pain), while vital signs remained stable. Fluid therapy, nasal cannula oxygen, and serial blood-gas monitoring were provided. Following a nephrology consultation, preparations for possible hemodialysis were made, but hemodialysis was not required. During the three-day follow-up, no hemolysis, hepatic or renal dysfunction, electrolyte abnormalities, or elevations of cardiac biomarkers developed; clinical and laboratory parameters were within normal limits, and the patient was discharged uneventfully.

Oral suspensions containing sodium alginate, sodium bicarbonate, and calcium carbonate act locally: on contact with gastric acid, they form a viscous gel ("raft") and do not require systemic absorption (6). Their physicochemical properties, however, make the IV route inherently hazardous. The suspension contains insoluble particulate calcium carbonate and is highly viscous, so intravascular injection carries a theoretical risk of vascular obstruction and pulmonary microembolism—the mechanism proposed for respiratory deterioration after IV simethicone and IV enteral feeds, in which microembolism of water-insoluble particles and non-specific activation of coagulation have been implicated (3,4). In addition, the sodium bicarbonate load and alkaline pH raise concerns about hemolysis, metabolic alkalosis, and hypernatremia, while the particulate calcium carbonate content may cause hypercalcemia. These considerations underpinned the poison center's recommendation for intensive monitoring with readiness for hemodialysis, and the initial plan to perform imaging for microembolism. The absence of significant systemic complications in our patient probably reflects the small volume administered (10 mL), immediate recognition of the error, and close monitoring but should not be interpreted as evidence that the IV administration of oral preparations is safe.

Route confusion in patients concurrently prescribed oral and IV medications arises when latent weaknesses in system defenses align (7). In our case, three such factors were evident: an oral suspension was drawn into a parenteral syringe that could physically connect to an IV line; the intended route was not communicated during task hand-off to a trainee nurse; and no barrier—such as an independent double-check or a route-specific connector—prevented the administration from occurring. Notably, the medication had been ordered on paper and via the electronic order-entry (e-order) system, yet the wrong-route administration still occurred, indicating that the vulnerability in this case lay in the administration (execution) step rather than in the prescribing step. The error was recognized only after the dose had been given, promptly and jointly by the nursing staff and the patient's relative, allowing immediate escalation and monitoring. Preventive strategies, therefore, need to target the administration step: physical separation of oral and IV preparations, dispensing oral liquids only in dedicated oral/enteral syringes, independent double-checks before administration, high-alert medication lists, and structured supervision of trainees. Specially designed enteral connectors that cannot be physically connected to IV lines (the ISO 80369-3/ENFit system) offer an additional engineering-based safeguard; however, these systems are not yet in widespread use in our country (4,8).

We report what we believe is the first case of inadvertent IV administration of an oral alginate–antacid suspension—a rare but potentially serious wrong-route medication error. The benign course observed here should not be mistaken for evidence of safety. Beyond individual vigilance, system-level engineering and process safeguards are essential to prevent similar events in emergency department practice.

Footnotes

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