EM CASE OF THE WEEK

BROWARD HEALTH

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Acetaminophen (APAP) Overdose

A 33 year old male with past medical history of sickle cell disease presents to the emergency department for nausea, vomiting, and lethargy for the past six hours. The patient recently ran out of his opiate pain medications and took 4 500mg Tylenol approximately 9 hours ago for sudden-onset thigh pain. He has not taken any other medications since this time. The patient has had progressive nausea with two episodes of non-bloody emesis. The patient takes hydroxyurea and oxycodone as needed at home. Patient reports no relevant surgical history, no allergies, and social history is non-contributory. Patient denies suicidal ideation. The patient is alert, oriented, and cooperative during your evaluation and a focused physical exam is unremarkable.

Selected lab values include:

- BUN:Cr: 25:1.3
- AST:ALT: 50:32
- ALP: 50
- UDS: negative
- Serum APAP level: 50 µg/ml

Which of the following is the next best step?

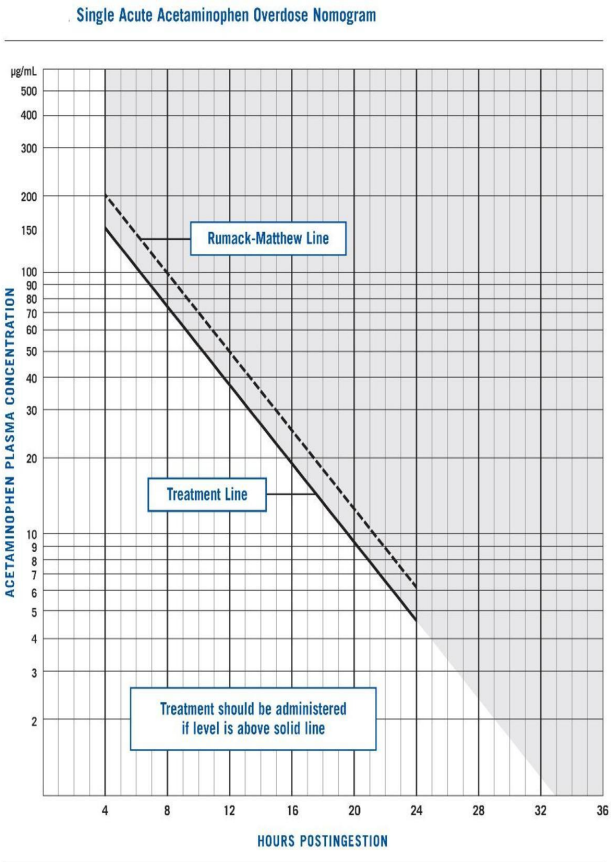
A. Treat with 140 mg N-acetylcysteine

B. Discharge home with reassurance

C. Activated charcoal

D. Supportive care, repeat APAP in 2 hours

E. Admission for GI consultation



Rumack-Matthew Nomogram

Chong, Jack F. (1/5/2017). Rumack-Matthew Nomogram. https://www.emnote.org/emnotes/rumack-matthew-nomogram

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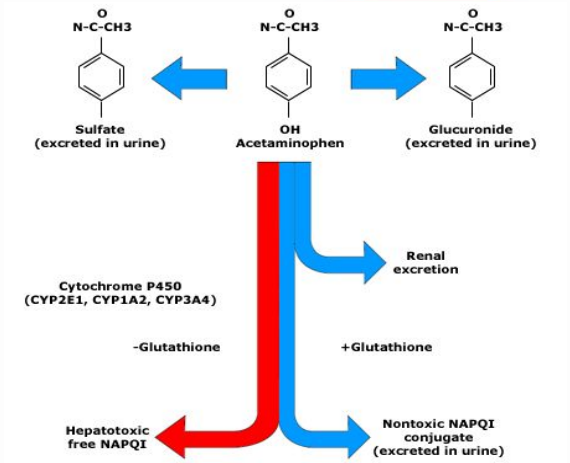
Discussion

The correct answer is D, supportive care and repeat APAP (acetaminophen) level in 2 hours.

Hepatic APAP toxicity is mediated via increased production of NAPQI, a byproduct of APAP metabolism by CYP450 2E1. NAPQI prevents the reduction of glutathione resulting in the inability of glutathione to prevent oxidative damage within hepatocytes. NAPQI buildup can cause acute liver failure as well as renal failure. Treatment with N-acetylcysteine (NAC) allows for replenishment of glutathione, providing protection against oxidative damage.

A thorough patient history, including quantity and timing of initial APAP ingestion, source of APAP ingestion, and any possible co-ingestions are critical during the initial evaluation. Pertinent diagnostic testing in the setting of APAP toxicity includes serum APAP level, CMP, CBC, and coagulation studies. Plotting the APAP level on the Rumack-Matthew Nomogram (ideally a 4-hour level) helps determine the need for treatment with N-acetylcysteine (NAC). It should be noted that this nomogram should only be used for acute ingestions. Management should occur with the assistance of a Poison Control Center.

This patient's 10-hour level of 50 µg/ml places him just below the treatment line on the Rumack-Matthew Nomogram; however, given the uncertain time of ingestion, we opted to continue supportive hydration and check another APAP level at 12 hours to ensure sufficient clearance. Furthermore, this decision was supported by the patient's relatively normal serum chemistry panel and liver function tests.



Heard, K., & Dart, R. (2017). Acetaminophen (paracetamol) poisoning in adults: Treatment. *UpToDate. Waltham, MA: UpToDate*

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Treatment

The window of benefit for decontamination therapy is controversial – different resources recommend anywhere between 1 and 4 hours from initial ingestion. While this patient presented later, there is convincing evidence that patients who present to the emergency department within 4 hours of ingestion (and certainly within 1 hour) may benefit from activated charcoal administration of 1g/kg. Indications for NAC include time-plotted APAP levels exceeding the treatment line for acute ingestion on the Rumack-Matthew Nomogram, a single ingestion of greater than 150 mg/kg, or any evidence of new liver damage after acetaminophen overdose.

Treatment with NAC via the two-bag system is as follows:

- For the first 4 hours, give 50 mg/kg/hr IV
- For the next 16 hours, give 6.25 mg/kg/hr IV

Treatment with oral NAC is as follows:

- 140 mg/kg PO loading dose
- After 4h, give 70 mg/kg PO for 17 doses

For patients experiencing acute liver failure secondary to APAP overdose, NAC at 6.25 mg/kg/hour should be continued until a transplant can be performed.

Take Home Points

- **For known acetaminophen overdoses, determination of the exact time of ingestion is critical to assessing need for NAC treatment**
- **Consult Poison Control (1-800-222-1222) to assist with treatment decisions**
- **For initial treatment, consider decontamination with activated charcoal (if <4h since ingestion)**
- **If indicated, timely treatment with N-acetylcysteine (NAC) significantly improves outcomes in APAP toxicity – some indications include APAP levels above the treatment line on the Rumack-Matthew nomogram (for acute ingestions) or a known single ingestion >150 mg/kg**

About the Author

This month's case was written by Jason Sreedhar. Jason is a 4th year medical student from NSU-COM. He completed his Emergency Medicine rotation at Broward Health North in July 2022 and plans on pursuing a career in Emergency Medicine.

References

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