

Management of Supratherapeutic Vancomycin Levels in a 10-year-old Child with Acute Renal Failure



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BACKGROUND

Intravenous (IV) vancomycin is a polypeptide antibiotic with a narrow therapeutic index and the potential for nephrotoxicity and ototoxicity. There are few existing case reports of vancomycin toxicity in children.

Risk factors for toxicity include a prolonged course of treatment (>7 days), elevated trough level (>20 mg/L), and pre-existing renal disease.

CASE PRESENTATION

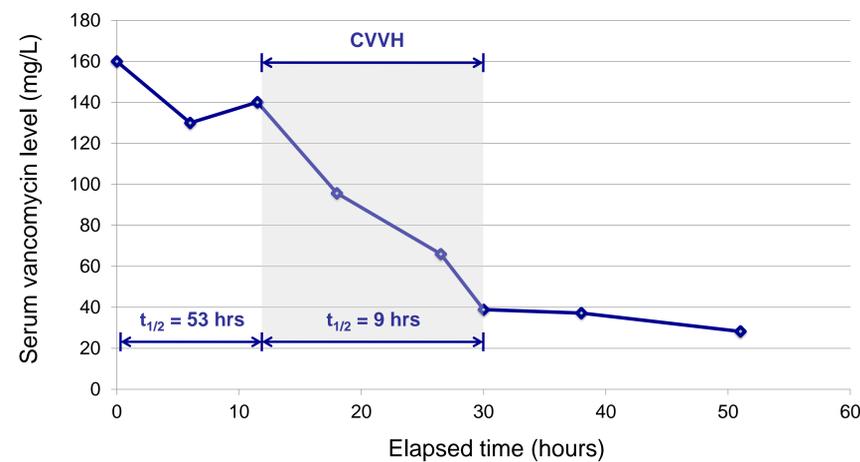
A 10-year-old, 46-kg male was admitted for treatment of cellulitis caused by multi-drug-resistant *S. aureus*. His initial renal function was normal, and he was started on vancomycin 1 gram IV every 8 hours.

No further monitoring was performed until hospital day 6, when the patient developed vomiting and oliguria.

The patient had developed acute renal failure, with BUN 21 mg/dL and Cr 3.8 mg/dL. Random serum vancomycin level at that time was 160 mg/L (therapeutic range, 10–20 mg/L).

No other etiology of his renal injury was identified, although he had received a single therapeutic dose of ibuprofen on the preceding day.

SERUM VANCOMYCIN LEVEL



MANAGEMENT

The patient was transferred to a pediatric tertiary care hospital, where continuous venovenous hemofiltration (CVVH) was performed with an HF 1200 filter (Medivators, Inc.) at a flow rate of 100 mL/min for 16.5 hours.

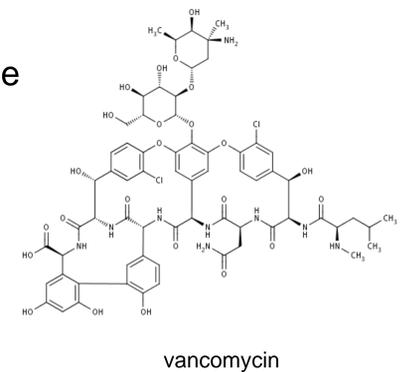
During CVVH, the patient's creatinine improved and his serum vancomycin level declined to 38.9 mg/L.

The patient's renal function recovered slowly and he was discharged home on hospital day 23.

DISCUSSION

Using a first-order elimination model, the vancomycin half-lives in this patient were estimated to be 53 hours before CVVH and 9 hours during CVVH.

In patients with normal renal function, the $t_{1/2}$ of vancomycin is 4-6 hours. Half-life may be as long as several days in patients with end-stage renal disease.



Vancomycin has a molecular weight of 1485 daltons, and a volume of distribution of 0.39 L/kg. It is 30-50% protein-bound, and is cleared primarily via glomerular filtration.

Previous case reports have described the use of CRRT with high-flux dialysis membranes^{1,2}, charcoal hemoperfusion³, and multi-dose activated charcoal⁴ to manage supratherapeutic vancomycin levels.

CONCLUSIONS

Supratherapeutic vancomycin levels can lead to acute renal toxicity or can be exacerbated by primary renal injury. The primary mechanism underlying this patient's toxicity is not known.

CVVH performed with a large-pore membrane enhances the clearance of vancomycin and decreases its serum elimination half-life.

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