Cardiovascular Collapse and NSTEMI Following Initiation of Vancomycin Infusion

Brandon Cunningham DO, Kamran Khattak MD, Saptarshi Biswas MD

Grand Strand Medical Center

Introduction

The antibiotic vancomycin is known for the possibility of causing a variety of adverse reactions when infused intravenously. In animal studies, it has been shown that vancomycin is a direct stimulator of mast cell degranulation.[1] Vancomycin Infusion Reaction (VIR), formerly described as red man syndrome, is dependent upon infusion rate, with resulting erythema and flushing of the skin that can develop across the upper body. In addition, like all compounds, there is the possibility of IgE-mediated anaphylactic type 1 hypersensitivity reactions and non-IgE-mediated anaphylactoid reactions, which occur due to direct chemical stimulation of mast cells.[4] In the perioperative setting when vancomycin may be used for surgical antibiotic prophylaxis, being able to ascertain an abrupt, life-threatening adverse reaction is paramount to providing effective and appropriate patient care.

Case Presentation

A 67-year-old male was scheduled to undergo elective total knee arthroplasty with planned preoperative medications to include 1.75g of vancomycin in 500ml 0.9% normal saline solution for surgical site infection prophylaxis to be infused slowly over the 2 hours prior to surgery start time while the patient was in a bed in the preoperative same day surgery suite. The patient's only reported allergy at the time was to oxycodone to which he experienced hives and had occurred over 20 years prior.

Immediately upon connection of the primed IV line to the patient's peripheral IV and the line opened, the patient reported experiencing sensation of fire spreading up his arm, diaphoresis, cutaneous flushing, hypotension, and became unresponsive at which point a rapid response event was called with the available anesthesia team and other available staff emergently bringing the patient to the PACU for management. At that time, the patient was found to have PEA arrest on cardiac monitor and ACLS management was initiated including CPR, IV crystalloid fluid boluses, endotracheal intubation, arterial line and left femoral triple lumen central venous catheter placement with multiple doses of epinephrine and sodium bicarbonate along with initiation of a dopamine drip. After roughly 10 minutes, ROSC was achieved. Approximately 20 minutes later, the patient went into ventricular fibrillation and ACLS management was restarted with defibrillation performed at 360J, and epinephrine, sodium bicarbonate, and amiodarone given. ROSC was again achieved after 5 minutes of CPR.

Stat 12-lead EKG, labs, chest x-ray, and cardiology consultation were obtained. Patient received IV diphenhydramine, methylprednisolone, famotidine and sedation with fentanyl and midazolam. 12-lead EKG at the time showed atrial fibrillation with rapid ventricular response and profound ST depressions, with no ST elevations noted per cardiology review. Once hemodynamically stable, the patient was taken for emergent CT angiography to rule out pulmonary embolism or aortic dissection. 2 hours after the event, patient's EKG returned to preoperative baseline of sinus rhythm with 1st degree AV block. Afterward patient was transported to the Medical Intensive Care Unit for observation and management. Patient was taken for cardiac catheterization with coronary angiography which showed mild nonobstructive atherosclerotic disease in the LAD, LCx, and RCA with mild catheter induced coronary spasm in the RCA. Transthoracic echocardiogram showed normal LVEF at 60-65% with no regional wall abnormalities.

No further events over night and patient successfully underwent spontaneous breathing trial and extubation. Upon examination at bedside 24 hours after event, patient was alert and oriented, as well as being able to recollect the sensation leading up to loss of responsiveness. Patient was discharged home on hospital day 3 with no known residual complications at that time.

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Objective Data

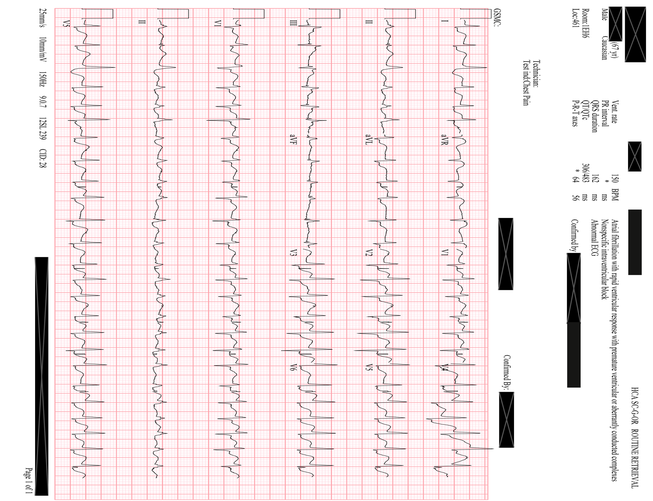

Figure 1. Initial EKG after PEA and Vfib arrest

07/11/22 10:56	CBC W/AUTO DIFFERENTIAL	5.0 / 13.8L / 40.7 / 151 RBC 4.79 , MCV 85.1 , MCH 28.9 , MCHC 33.9 , RDW 14.1 H, GRAN % 59.9 , LYMPH % 26.3 , MONO % 10.8 , EOS % 1.7 , BASO % 1.3 H, GRAN # 3.0 , LYMPH # 1.3 , MONO # 0.5 , EOS # 0.1 , BASO # 0.1
07/11/22 10:56	URINALYSIS DIPSTICK W REF CULT	COLOR Light-Yellow , APPEARANCE Clear , GLU NEGATIVE , BILIRUBIN NEGATIVE , KETONE NEGATIVE , SPEC GRAV 1.019 , BLOOD NEGATIVE , PH 5.5 , PROTEIN NEGATIVE , UROBIL NEGATIVE , NITRITE NEGATIVE , LEUK ESTER NEGATIVE
07/11/22 10:56	COMPREHENSIVE METABOLIC PANEL	145 / 107 / 18 / 4.9 / 29 / 1.10 / 100 NA CORRECT... 145 , ANION GAP 9.0 , GFR CKD-EP... 74 *, BUN/CREA 16 , TOTAL PROT... 7.2 , ALBUMIN 4.3 , GLOB 3.0 , A/G RATIO 1.4 , CALCIUM 9.4 , CORRECTED ... 9.2 *, TOTAL BILI... 0.5 , AST 32 , ALT 22 , ALK PHOS T... 84

Figure 2. Preoperative labs, 1 month prior to event

08/03/22 10:05	CBC W/AUTO DIFFERENTIAL	9.4 / 14.5 / 43.3 / 190 RBC 5.00 , MCV 86.5 , MCH 29.0 , MCHC 33.5 , RDW 13.9 , GRAN % 41.7 , LYMPH % 52.9 H, MONO % 4.9 L, EOS % 0.3 , BASO % 0.2 , GRAN # 3.9 , LYMPH # 5.0 H, MONO # 0.5 , EOS # 0.0 , BASO # 0.0
08/03/22 10:05	LACT ACID REFLX	LACT ACID ... 7.6 H*
08/03/22 09:55	BLD GAS CHEM	PH BG POC 7.286 *L , PCO2 BG PO... 51.9 *H , PO2 BG POC 23.5 *L , TCO2 BG PO... 25 *, HCO3 BG PO... 24.8 *, BASE EXCES... -2.5 L, sO2 BG POC 34 L, FIO2 100 , SAMPLE TYP... Venous , ALLENS TES... N/A , DELIVERY S... Bagging , NA POC 141 , K POC 4.8 H, CL POC 106 , GLUC POC 128 H, CA IONIZED... 0.87 L, CREATININE... 1.2 H, BUN POC TNP , HGB POC 13.5 , HCT POC 40.0

Figure 3. Immediate post event labs

Lactic Acid Level

*** Lifeti

Previous Page

Date	Time	Result
Aug 03,22	19:37	2.4 H
Aug 03,22	16:05	2.6 H
Aug 03,22	12:30	7.0 H
Aug 03,22	10:05	7.6 H

Troponin I

*** Lifetim

Previous Page

Date	Time	Result
Aug 04,22	05:34	2.600 *H
Aug 04,22	01:58	3.340 *H
Aug 03,22	12:30	0.474 H
Aug 03,22	10:05	< 0.012

Figure 4. Lactic Acid and Troponin Trends

Discussion

This patient had a major adverse reaction to vancomycin IV infusion which resulted in major complications including cardiovascular collapse, NSTEMI, lactic acidosis, respiratory acidosis, severe hypokalemia, rib and sternal fractures secondary to CPR. In light of his mild coronary artery disease, his cardiac event is suspected to be a result of vasospasm. Cardiac arrest has been previously described as a sequalae of a reaction to vancomycin.[3,5] The event is complicated by the difficulty discerning whether what occurred was VIR, anaphylaxis, or an anaphylactoid reaction. A prerequisite for anaphylaxis is prior drug exposure which this patient was discovered to have upon chart review.[2] The patient had received infusions of vancomycin at least 3 times previously in the prior year for SSI prophylaxis without issue. This patient had an elevated tryptase level which has been previously reported as being a differentiator supporting anaphylaxis as opposed to anaphylactoid and VIR.[4]

Conclusion

Differentiation of possible diagnoses of adverse reactions in the perioperative setting is important for the management of surgical patients who may be receiving new and even previously received medications. Initial management of securing the airway, breathing, and circulation should be prioritized, but further identification of causative and delineating factors will assist in appropriate management of the acute condition and prevention of further deterioration and adverse events.

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