Vancomycin-associated neutropenia in hemodialysis patient with sepsis

Esraa Shukri Altawil, Fadi Saleh Aljamaan

ABSTRACT

Introduction: Vancomycin-induced neutropenia is a rare but serious adverse reaction that appears to occur with prolonged use with a minimum of seven days. In most cases, it has been reported to resolve spontaneously upon discontinuation of vancomycin.

Case Report: A 53-year-old male admitted as a case of septic arthritis complicated with sepsis in which vancomycin induced prolonged neutropenia occurred after nine days of therapy and was associated with toxic serum level.

Conclusion: Vancomycin induced neutropenia may occur at any dose or duration of therapy, but generally it is associated with prolonged use for more than seven days. Our findings suggest that clinicians should be cautious about it as it can occur at any time in the course of treatment, and may last for longer time especially in hemodialysis patients in addition to being linked to the toxic serum level. All patients who receive vancomycin for more than seven days should have white blood cells count and differential counts monitored weekly. Discontinuation of the drug appears to be prudent as soon as this hematological abnormality detected

International Journal of Case Reports and Images (IJCRI)

International Journal of Case Reports and Images (IJCRI) is an international, peer reviewed, monthly, open access, online journal, publishing high-quality, articles in all areas of basic medical sciences and clinical specialties.

Aim of IJCRI is to encourage the publication of new information by providing a platform for reporting of unique, unusual and rare cases which enhance understanding of disease process, its diagnosis, management and clinico-pathologic correlations.

IJCRI publishes Review Articles, Case Series, Case Reports, Case in Images, Clinical Images and Letters to Editor.

Website: www.ijcasereportsandimages.com

CASE REPORT

PEER REVIEWED | OPEN ACCESS

Vancomycin-associated neutropenia in hemodialysis patient with sepsis

Esraa Shukri Altawil, Fadi Saleh Aljamaan

ABSTRACT

Introduction: Vancomycin-induced neutropenia is a rare but serious adverse reaction that appears to occur with prolonged use with a minimum of seven days. In most cases, it has been reported to resolve spontaneously upon discontinuation of vancomycin. **Case Report:** A 53-year-old male admitted as a case of septic arthritis complicated with sepsis in which vancomycin induced prolonged neutropenia occurred after nine days of therapy and was associated with toxic serum level. **Conclusion:** Vancomycin induced neutropenia may occur at any dose or duration of therapy, but generally it is associated with prolonged use for more than seven days. Our findings suggest that clinicians should be cautious about it as it can occur at any time in the course of treatment, and may last for longer time especially in hemodialysis patients in addition to being linked to the toxic serum level. All patients who receive vancomycin for more than seven days should have white blood cells count and differential counts monitored weekly. Discontinuation of the drug appears to be prudent as soon as this hematological abnormality detected.

Keywords: Vancomycin, Neutropenia, Sepsis, Toxic level

How to cite this article

Altawil ES, Aljamaan FS. Vancomycin-associated neutropenia in hemodialysis patient with sepsis. Int J Case Rep Images 2017;8(3):184–186.

Article ID: Z01201703CR10770EA

doi:10.5348/ijcri-201731-CR-10770

INTRODUCTION

Vancomycin-induced neutropenia, defined as an absolute neutrophil count (ANC) less than 1000 cells/mm³, is a rare but serious adverse reaction has been reported to occur at rates of 2–12% [1, 2]. In 1960, shortly after the introduction of the drug, Dangerfield et al. published the first two case reports [1].

The onset of neutropenia does appear to occur with prolonged treatment duration with at least seven days and mostly occurring at 20th day after therapy initiation [3]. Although the mechanism of action of the neutropenia is controversial, several theories have been proposed including an immunological mechanism with an IgG or IgM immune-mediated hypersensitivity reaction [4]. Evidence to support this hypothesis includes studies examined the bone marrow of patients with vancomycin induced neutropenia which reveal granulocyte-specific antibodies [5, 6]. Another suggested mechanism is direct toxicity to the bone marrow. This has been supported by hypo-cellular marrow with maturation arrest on bone marrow biopsy [7].

In all of the cases, neutropenia has been reversible and resolve spontaneously upon withdrawal of vancomycin.

Esraa Shukri Altawil¹, Fadi Saleh Aljamaan²

Affiliations: ¹Critical Care Clinical Pharmacist, Pharmacy department, KSUMC, Riyadh, SA; ²MD, Assistant Professor, Intensive Care Department, KSUMC, Riyadh, SA.

Corresponding Author: Esraa S. Al Tawil, Msc, BCCCP, BC-NSP, BCPS, Critical Care Clinical Pharmacist, King Saud University Medical City, Riyadh, Saudi Arabia (SA), P.O. Box 3354, Riyadh, 11211; E-mail: ealtawil@ksu.edu.sa

Received: 16 November 2016

Accepted: 12 December 2016

Published: 01 March 2017

Improvement generally occurs within a few days of vancomycin discontinuation [2], but, in patients who are undergoing hemodialysis, prolonged neutropenia for up to 4 weeks has been observed [8].

CASE REPORT

A 53-year-old male, a known case of diabetes mellitus and hypertension for 20 years, presented with ischemic heart disease for the last 12 years, and chronic kidney disease for the last five years. He was admitted to the hospital as a case of left shoulder septic arthritis as a complication of intra-articular steroid injection for tendonitis, started empirically on vancomycin 1 g IV every 24 hours and clindamycin 600 mg IV q 8 hr. Two days later, blood culture revealed methicillin sensitive staphylococcus aureus (MSSA) at which both antibiotics stopped and cloxacillin 2 g IV every 4 hr was initiated.

Throughout his hospital stay he developed acute on top of chronic renal failure requiring hemodialysis. On day-25 he developed hypotension during dialysis session, associated with decreased level of consciousness (LOC), which mandated transfer to intensive care unit. Furthermore, he developed acute respiratory distress syndrome (ARDS) requiring mechanical ventilation in addition to severe circulatory failure all of that due to septic shock. The patient's intravenous (IV) antibiotics were escalated to meropenem 1 g IV q 12 hr and vancomycin 1 g IV q 24 hr (target trough level 10–15) with full septic screen sent.

The daily vancomycin trough level continued to be supra-therapeutic (range 17–28 µg/mL), given patient's poor renal function, mandating several times of dose holding. Despite the maximum therapeutic care provided, patient's condition started to deteriorate manifested by severe hemodynamic instability demanding maximum doses of vasopressors. On day-31, his blood gases analysis was consistent with severe hypoxemia in addition to lactic acidosis. Laboratory results showed neutropenia with ANC 200 cells/mm³ (baseline was 6,200 cells/mm³), in which vancomycin stopped after total duration of nine days (cumulative dose received 5 g), and filgrastim (G-CSF) 300 µg SC started. Patient remained on meropenem and cloxacillin resumed over. Blood culture showed *Pseudomonas aeruginosa* for which colistin was added (loading dose of 9 million units IV followed by maintenance dose 2 million units IV every 8 hr). The neutrophil count continued to fall to < 100 cells /mm³ reaching undetectable amount even after he received seven doses of G-CSF (Figure 1). On day-40, the patient had worsening multiorgan failure and was declared for comfort care ending with cardiorespiratory arrest.

DISCUSSION

Several published case reports demonstrated neutropenia as an adverse event associated with

Figure 1: Total white blood cell count and absolute neutrophil count for the patient, G-CSF 300 µg subcutaneous was initially administered on day-9 on daily basis (total seven doses).

vancomycin therapy, nevertheless, to date there are no published prospective studies assessing this important clinical complication. Neutropenia may occur at any dose, but generally with the prolonged vancomycin use for more than seven days. To our knowledge, this is the first case report addressed vancomycin induced neutropenia in Saudi Arabia.

Many of the cases reported included patients receiving concomitant drugs also known to cause neutropenia, resulting in uncertainty with the influence of vancomycin. Based on the Naranjo probability scale, the association of vancomycin with neutropenia was considered as probable in our case. In addition to delayed onset, vancomycin induced neutropenia has always been reported as reversible, with complete resolution taking place in 2–5 days which is not the case. Factors, other than drug related, including sepsis and hemodialysis could be the cause of our patient's prolonged neutropenia.

Latest American Society of Health-System Pharmacists and the Infectious Diseases Society of America (ASHP/IDSA) guidelines did not indicate the need of frequent monitoring of leukocyte count while receiving vancomycin [9]. Although there are no guidelines or recommendations exist for the use of G-CSF in vancomycin-induced neutropenia, several case reports have shown successful treatment of vancomycin-induced neutropenia with G-CSF while continuing use of vancomycin [4]. It is crucial that patients undergoing prolonged vancomycin therapy remain under close monitoring with at least once weekly laboratory testing for blood counts.

At present, it is uncertain whether patients with history of vancomycin-associated neutropenia would develop the same response if re-challenged with vancomycin. Koo et al. has reported a successful case where a patient who recovered from vancomycin induced neutropenia restarted on a five days course and at a lower dose without recurrence of neutropenia. In most circumstances, clinicians prefer to use an alternative agent rather than resuming the offending agent. Further studies are needed to conclude the possibility of neutropenia with repeat exposure to vancomycin [10].

CONCLUSION

Vancomycin induced neutropenia may occur at any dose, but generally with the prolonged vancomycin use for more than seven days. Our findings suggest that clinicians should be cautious that vancomycin-associated neutropenia can occur at any time in the course of treatment, and can be linked to the toxic serum level. All patients who receive vancomycin for more than seven days should have white blood cell and differential counts monitored weekly. Discontinuation of the drug appears to be prudent as soon as this hematological abnormality detected.

Author Contributions

Esraa S. Altawil – Substantial contributions to conception and design, Acquisition of data, Analysis and interpretation of data, Drafting the article, Revising it critically for important intellectual content, Final approval of the version to be published

Fadi S. Aljamaan – Analysis and interpretation of data, Revising it critically for important intellectual content, Final approval of the version to be published

Guarantor

The corresponding author is the guarantor of submission.

Conflict of Interest

Authors declare no conflict of interest.

Copyright

© 2017 Esraa S. Altawil et al. This article is distributed under the terms of Creative Commons Attribution License which permits unrestricted use, distribution and reproduction in any medium provided the original author(s) and original publisher are properly credited. Please see the copyright policy on the journal website for more information.

REFERENCES

1. Dangerfield HG, Hewitt WL, Monzon OT, Kudinoff Z, Blackman B, Finegold SM. Clinical use of vancomycin. *Antimicrob Agents Annu* 1960;428–37.
2. Pai MP, Mercier RC, Koster SA. Epidemiology of vancomycin-induced neutropenia in patients receiving home intravenous infusion therapy. *Ann Pharmacother* 2006 Feb;40(2):224–8.
3. Black E, Lau TT, Ensom MH. Vancomycin-induced neutropenia: Is it dose- or duration-related? *Ann Pharmacother* 2011 May;45(5):629–38.
4. Lai KK, Kleinjan J, Belliveau P. Vancomycin-induced neutropenia treated with granulocyte colony-stimulating factor during home intravenous infusion therapy. *Clin Infect Dis* 1996 Oct;23(4):844–5.
5. Domen RE, Horowitz S. Vancomycin-induced neutropenia associated with anti-granulocyte antibodies. *Immunohematology* 1990;6(2):41–3.
6. Schwartz MD. Vancomycin-induced neutropenia in a patient positive for an antineutrophil antibody. *Pharmacotherapy* 2002 Jun;22(6):783–8.
7. Olaison L, Belin L, Hogevis H, Alestig K. Incidence of beta-lactam-induced delayed hypersensitivity and neutropenia during treatment of infective endocarditis. *Arch Intern Med* 1999 Mar 22;159(6):607–15.
8. Milstien S, Welik R, Heyman MR. Prolonged vancomycin-associated neutropenia in a chronic hemodialysis patient. *Am J Med Sci* 1987 Aug;294(2):110–3.
9. Rybak M, Lomaestro B, Rotschafer JC, et al. Therapeutic monitoring of vancomycin in adult patients: A consensus review of the American Society of Health-System Pharmacists, the Infectious Diseases Society of America, and the Society of Infectious Diseases Pharmacists. *Am J Health Syst Pharm* 2009 Jan 1;66(1):82–98.
10. Koo KB, Bachand RL, Chow AW. Vancomycin-induced neutropenia. *Drug Intell Clin Pharm* 1986 Oct;20(10):780–2.

Access full text article on
other devices

Access PDF of article on
other devices

Edorium Journals: An introduction

Edorium Journals Team

About Edorium Journals

Edorium Journals is a publisher of high-quality, open access, international scholarly journals covering subjects in basic sciences and clinical specialties and subspecialties.

Invitation for article submission

We sincerely invite you to submit your valuable research for publication to Edorium Journals.

But why should you publish with Edorium Journals?

In less than 10 words - we give you what no one does.

Vision of being the best

We have the vision of making our journals the best and the most authoritative journals in their respective specialties. We are working towards this goal every day of every week of every month of every year.

Exceptional services

We care for you, your work and your time. Our efficient, personalized and courteous services are a testimony to this.

Editorial Review

All manuscripts submitted to Edorium Journals undergo pre-processing review, first editorial review, peer review, second editorial review and finally third editorial review.

Peer Review

All manuscripts submitted to Edorium Journals undergo anonymous, double-blind, external peer review.

Early View version

Early View version of your manuscript will be published in the journal within 72 hours of final acceptance.

Manuscript status

From submission to publication of your article you will get regular updates (minimum six times) about status of your manuscripts directly in your email.

Our Commitment

Six weeks

You will get first decision on your manuscript within six weeks (42 days) of submission. If we fail to honor this by even one day, we will publish your manuscript free of charge.*

Four weeks

After we receive page proofs, your manuscript will be published in the journal within four weeks (31 days). If we fail to honor this by even one day, we will publish your manuscript free of charge and refund you the full article publication charges you paid for your manuscript.*

Favored Author program

One email is all it takes to become our favored author. You will not only get fee waivers but also get information and insights about scholarly publishing.

Institutional Membership program

Join our Institutional Memberships program and help scholars from your institute make their research accessible to all and save thousands of dollars in fees make their research accessible to all.

Our presence

We have some of the best designed publication formats. Our websites are very user friendly and enable you to do your work very easily with no hassle.

Something more...

We request you to have a look at our website to know more about us and our services.

* Terms and condition apply. Please see Edorium Journals website for more information.

We welcome you to interact with us, share with us, join us and of course publish with us.

Edorium Journals: On Web

Browse Journals

CONNECT WITH US