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CASE REPORT

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Vancomycin Induced Nephrotoxicity: A Case Report

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ABSTRACT

Nephrotoxicity associated with vancomycin is a commonly feared and mainly preventable adverse effect. Non-severe cases of vancomycin nephrotoxicity resolve upon discontinuation of the medication. We present the case of a 45-year-old man who developed renal dysfunction following vancomycin antibiotic therapy as a result of lack of dose adaptation to measured serum nadirs.

KEYWORDS: Vancomycin, Nephrotoxicity, Renal Dysfunction

INTRODUCTION

Acute renal dysfunction is a known side effect of vancomycin therapy. If several potentially nephrotoxic drugs are combined, the risk of developing acute kidney injury with vancomycin increases.[1] In order to avoid drug induced toxicities and to achieve effective efficacy levels, therapeutic drug monitoring is routinely recommended for vancomycin. According to a study, a serum nadir of 10 to 15 µg/mL must be aimed for to avoid resistance to Staphylococcus aureus.[2] In the current case, the administration of vancomycin and a lack of dose adaptation to measured serum nadirs resulted in renal dysfunction with far-reaching clinical consequences.

CASE REPORT

A 45-year-old male patient received in-patient chemotherapy with rituximab, dexamethasone, vincristine, methotrexate, cyclophosphamide, doxorubicin for Burkitt's lymphoma. Valganciclovir was initiated after cytomegalovirus reactivation. The further medication consisted of caspofungin in status post candidemia, cotrimoxazole for prophylaxis of pneumocystis jiroveci pneumonia and hydromorphone. The acute tolerance of the chemotherapy was satisfactory, and the renal retention parameters were always in the normal range. Over the further hospital stay, the patient developed febrile temperatures and significantly increasing inflammatory parameters. As a consequence, a calculated antibiotic therapy with piperacillin/tazobactam and vancomycin was initiated. Vancomycin therapy was started with a dose of 1 g and increased from the second administration to 1.5 g. The first level determination on day 3 yielded a value of 19.2 µg/mL, the calculated absolute glomerular filtration rate (eGFR) was 41 mL/min. Once a nadir of 41.8 µg/mL was achieved on day 4 with unchanged vancomycin administration, vancomycin was discontinued. On day 5, the nadir reached a maximum value of 45.3 µg/mL, the absolute eGFR dropped to 11 mL/min by day 7. Other potentially nephrotoxic drugs such as and cotrimoxazole were paused from day 4. Caspofungin and hydromorphone were continued, piperacillin/tazobactam reduced to twice daily administration. The patient additionally received two liters daily of sodium chloride, furosemide, and calcium and magnesium substitution. On day 16, the paused anti-infective therapy was restarted, adapted to the current absolute eGFR of 51 mL/min. Nevertheless, there was an outbreak of the cytomegalovirus infection, which required a postponement of the next chemotherapy due to the high therapy pressure resulting in a progression of the lymphoma.

DISCUSSION

International guidelines and the Summary of Product Characteristics make reference to monitoring of serum nadirs with vancomycin therapy.[2,3] In the case of the reported patient, a Therapeutic Drug Monitoring was performed as recommended, but the results were not adjusted to the nadirs above the target range (19.2 µg/mL) and the impaired renal function (eGFR 41 mL/min). Practical experiences show that the dosage of vancomycin is often based on empirical values and is passed on verbally. Furthermore, the patient received several potentially nephrotoxic drugs, which worsened the acute renal dysfunction. An increased risk of renal dysfunction for the combination of

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piperacillin/tazobactam and vancomycin has also been the subject of more intense discussion in recent times. It has been proposed in this that piperacillin potentiates the nephrotoxic effect of vancomycin, but the exact mechanism has not yet been fully explained.[4] In cases of acute kidney injury, appropriate measures must be taken quickly. This includes the review of the medication for nephrotoxic drug substances and, if possible, pausing this medication and, if necessary, replacement with suitable alternatives. Pausing drug substances that are of essential importance, such as the antiviral therapy in the patient in this case report, is problematic. Consequence of the interrupted valganciclovir therapy was the flare-up of the cytomegalovirus infection, where upon planned chemotherapy was postponed.

In order to support the anti-infective therapy in everyday clinical practice, it is recommended to create easily accessible internal standards for the prescribers. In patients with multiple nephrotoxic drugs, worsening of renal function should be watched out for and, if necessary, alternative substances should be used. According to the Summary of Product Characteristics, a dose of 450 mg twice weekly is indicated for valganciclovir with a GFR of 10 to 24 mL/min.

CONCLUSION

The compilation of internal standards is an important component of a safe drug therapy to enforce a rational drug use. Risk cases, for example patients with multiple nephrotoxic drugs, should be monitored especially closely. When creating local standards, evaluating drug-induced nephrotoxicity, dose adjustments/alternative drugs in kidney failure and when performing a Therapeutic Drug Monitoring, a pharmacist can provide valuable input.

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