The serum vancomycin assay: A test of historic interest

Vancomycin is a glycopeptide antibiotic that has been in clinical use for approximately 35 years. Use of vancomycin has increased significantly over the past decade (1) largely because of the increased prevalence of infections due to coagulase-negative staphylococci, often related to intravascular and other prosthetic devices. In some locales, the emergence of methicillin-resistant Staphylococcus aureus (MRSA) has been a major factor contributing to increased vancomycin use.

It has become standard practice to monitor serum vancomycin concentrations routinely in patients receiving vancomycin (1-3). Sensitive, accurate and easy to perform assays are readily available, particularly the fluorescence polarized immunoassay. In the past several years, the conventional wisdom of routine monitoring of serum vancomycin concentrations has been challenged (4-7). It is particularly timely in light of diminishing health care resources in conjunction with the growth of evidence-based medicine that vancomycin serum monitoring be reassessed.

RATIONALE FOR THERAPEUTIC DRUG MONITORING

Recently, Cantú et al (6) reiterated the principles underlying therapeutic drug monitoring (TDM):

- There must be a reliable assay available.
- There must be a correlation between the serum drug concentration and clinical efficacy and/or drug toxicity.
- If a correlation between serum drug concentrations and either efficacy or toxicity is known, there must be significant interpatient variability in drug pharmacokinetics, such that predictable serum concentrations cannot be achieved with empirical or weight-based dosing regimens.

TDM AND AMINOGLYCOSIDES

With eight-hourly dosing of most aminoglycosides such as gentamicin, all of the underlying principles of TDM are present and, therefore, routine monitoring is logical using this dosing regimen. However, with once-daily aminoglycoside dosing, it can be strongly argued that empirical weight-based dosing regimens will consistently result in both therapeutic peak concentrations that take advantage of the drug’s concentration-dependent killing, as well as low trough concentrations to minimize toxicity so that routine TDM is unnecessary (8).

TDM AND VANCOMYCIN

As far as vancomycin is concerned, there is no doubt that there is a reliable and easy to perform serum drug assay. However, there is little, if any, evidence to support a correlation between any particular serum vancomycin concentration range and clinical efficacy (3-7). Likewise, there are few data to suggest that adverse effects are related to any particular serum concentration range (4-6). Indeed, whether vancomycin alone is nephrotoxic or ototoxic is controversial, although the balance of evidence does suggest that vancomycin potentiates aminoglycoside toxicity (7). Furthermore, standard vancomycin dosing with 2 g/day (either 1 g every 12 h or 500 mg every 6 h) in most adults with good renal function (or 30 mg/kg/day for children) consistently results in vancomycin peak concentrations from 18 to 47 µg/mL and trough concentrations from 2 to 13 µg/mL. These concentrations are in excess of the minimum inhibitory concentrations for nearly all strains of S aureus and Streptococcus species (9).

Finally, the cost and discomforts associated with serum vancomycin monitoring must be considered. Each pair of samples results in two additional venepunctures, and the cost of these two assays is approximately $38 on a cost recovery basis (personal communication).

RECOMMENDATIONS

In view of the evidence, we and others (4-7) believe that routine monitoring of serum vancomycin concentrations is not indicated and should not be performed. However, there are a few select patient populations in which serum vancomycin monitoring should be considered. The first group of patients is those with rapidly changing renal function. The second is patients receiving hemodialysis with high flux dialysis membranes that are capable of removing some vancomycin (10). The third group of patients is those who appear not to respond clinically to vancomycin therapy. For other patients, periodic
monitoring of serum creatinine is sufficient to detect when dose alterations should be made; these dose alterations can effectively be made by a dosing nomogram (11).

To conserve diminishing health care resources, the utility of all diagnostic tests must be critically evaluated. Tests that add costs without providing meaningful clinical benefits need to be abandoned. Routine serum monitoring for vancomycin concentrations clearly falls into this category of tests. Our precious health care resources can be far better utilized.

REFERENCES


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