Gentamicin and vancomycin therapeutic drug monitoring in newborns: evaluation of practices

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INTRODUCTION

Gentamicin and vancomycin therapy warrants therapeutic drug monitoring (TDM) for both efficacy and toxicity reasons. For gentamicin two dosing regimens are described: multiple daily (MDD) and once-daily dosing (ODD). Measuring of trough concentration is recommended. In case of gentamicin MDD peak concentration should be measured, too. In newborns, blood sampling should be minimal to prevent pain and risk of anaemia.

In the absence of strict recommendations at our institution, it was hypothesized that dosing and TDM of gentamicin and vancomycin were heterogenic and blood sampling too frequent.

MATERIALS AND METHODS

- Retrospective chart study over 12 months (01.04.2008 – 31.03.2009) including all newborns receiving either gentamicin or vancomycin.
- Setting: Neonatology and pediatric intensive care unit at a university hospital.
- Chart analysis critera: % of MDD vs ODD gentamicin regimens, mean number of blood sampling, % of treatments with peak or trough level monitoring, % of concentrations outside recommended therapeutic ranges followed by treatment adaptation (gentamicin: through level <2 mg/L, peak level 5-10 mg/L; vancomycin: through level 5-10 mg/L). Results are expressed as mean +/-SD, statistical analysis was performed using the U-Mann-Whitney test.

RESULTS

Gentamicin

- 102 newborns included (mean gestational age: 34.0 +/- 5.1 weeks)
- 119 treatments (mean length of 3.1 +/-3.1 days)
- Initial dosing regimen:
  - 67 (57%) MDD
  - 48 (40%) ODD
  - 4 (3%) Mixed scheme

Blood level measurement:

- Through levels were more frequently >2mg/L with MDD than with ODD (19.2 v. 7.4%).
- Physicians interrupted treatment after measuring of high trough levels (>1.5 mg/L): in 73% of the cases levels were repeatedly measured, followed by dosing adaptation. In 22% of the cases treatment was stopped.
- Peak levels were measured in 50% of MDD and in 12% of ODD courses. Peak levels < 5 mg/L led to dosing adaptation in only 33% of the cases.
- More blood was sampled with MDD than with ODD (mean number of sampling per treatment course: 2.7 +/- 1.6 vs 1.3 +/- 1.1, p< 0.01).

Vancomycin

- 37 newborns included (mean gestational age: 30.8 +/- 3.9 weeks)
- 41 treatments (mean length of 6.5 +/- 5.2 days)
- Mean number of blood sampling: 2.5 +/- 2.1
- Blood level measurement:
  - 31% of through levels were >10mg/L and led to dosing adaptation in 89% of all cases.
  - 11% of through levels were <5mg/L, but dosing was adapted in only 16% of all cases.

DISCUSSION, CONCLUSION

Dosing pattern of gentamicin and TDM of gentamicin and vancomycin in newborns were very heterogenic in the neonatology and pediatric intensive care units of our institution. TDM was performed in order to avoid toxic levels, but less frequently to ensure pharmacological efficacy. Strict guidelines have now been developed and implemented to standardize dosing practices, to reduce unnecessary blood sampling, and to improve management of subtherapeutic levels. Their impact will be evaluated.