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Case Report

Amikacin overdose in infant

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ABSTRACT

Introduction: Amikacin is an aminoglycoside used in the treatment of a wide variety of infections. It has the broadest spectrum of action amongst the aminoglycosides. It is often associated with dire side effects like nephrotoxicity and ototoxicty. The recommended dose for Amikacin is 15 mg/kg per day as a single dose.

An 8 month infant was exposed to 10 times the normal amikacin dose. No treatment was given. Later on, no side effects were observed either.

Previously overdoses like that observed in the above case have occurred. Those cases were immediately treated as opposed to our case and no further sequelae were observed in any of those cases either.

There seems to be enough reason to doubt the need for immediate treatment in the case of amikacin overdose, instead, careful observation seems to be more appropriate.

1. Background

Amikacin is an aminoglycoside antibiotic medication. It has the broadest spectrum of action in its group. It is the preferred drug for the empirical treatment of nosocomial gram negative bacillary infections, especially those showing resistance to other aminoglycosides. It is also useful in treating drug resistant tuberculosis. Its recommended dose is 15mg/kg/day. Side effects common to Amikacin are ototoxicity, hearing loss and nephrotoxicity.[1]

2. Case Presentation

An infant of 8 months weighing about 8 kg was admitted to the emergency department of the hospital due to the complaint of persistent diarrhea. A diagnosis of gastroenteritis was made. The patient was started on Injection Amikacin at 7.5 mg/kg twice a day along with ORS and supportive therapy of Zn and probiotics. Accidently, instead of 7.5mg, 750mg of Amikacin was administered due to non-availability of low dose formulations and carelessness on part of the administering nurse. Noting the normal clinical parameters, a decision was made to stop the drug and observe the child instead to starting immediate detoxification measures. At 12 hours after the overdose, the patient showed normal vitals and his BUN and creatine levels were 22mg/dl and 0.7mg/dl respectively. Urine output was recorded normal. Patient was discharged 5 days later when clinical recovery was achieved and when renal profile showed no abnormalities. BERA test was done after 1 month which was also normal. Child showed normal milestones at 1 year of age.

3. Discussion

Amikacin is a crucial antibiotic in serious bacterial infection, especially gram negative bacilli and even in resistant infections with Acinetobacter and Pseudomonas. It is also an antibiotic of choice in certain Enterobacteria like Nocardia. It also has a role in curing resistant mycobacterial infections and hospital acquired infections.[1]

Amikacin is a bactericidal antibiotic and acts by inhibition of 30 S ribosomal subunit of bacterial DNA effecting in reducing protein synthesis needed for bacterial

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survival.[1]

Amikacin is known to be nephrotoxic and ototoxic and accordingly reducing dose adjustments are often needed depending upon the creatine clearance.

Nephrotoxicity is the most common toxicity noted with Amikacin use. It is seen in 1-10% cases. It is often reversible if detected early and when the medicine is withdrawn.[2]

Amikacin is also excreted in breast milk. Even pregnant and nursing women are also advised to be treated with caution when Amikacin use couldn't be avoided.

Clinicians are also discouraged from using Amikacin with any other nephrotoxic drug. Amikacin should also be avoided in patients on neuromuscular blockers as it can prolong paralysis in them.

Amikacin is also not recommended routinely in infants as drug stays in body for longer period of time due to large volume of distribution.

Standard dose of Amikacin in most serious bacterial infections is a maximum of 15 mg/kg/day in two or three divided doses. In this case, 750 mg for the body weight of 8 kg that is more than six times the therapeutic dose per day was administered as a single bolus dose.

Previously such cases of overdose have been rarely observed. Three accidental cases (6, 6.5 and 8 times the normal dose) and one case of a woman suffering from subarachnoid hemorrhage who received 20 times the normal dose have been reported.[3,4] In all of these cases, immediate treatment was given to the patient. The patients were put on a dialysis machine and the renal clearance of the drug was increased in order to eliminate the drug from the body. After the treatment, no signs of Amikacin toxicity were reported in any of the cases.

All of these cases involved patients with normal renal function, which assisted their proper management.[4]In the case observed, the child was exposed to 9 times the normal dose of the drug. He did not undergo any corrective measures, yet no signs of toxicity were observed in him.

Ototoxicity of Amikacin is less studied and it appears to be dose dependent too.[5] Some disease conditions including hypotensive diseases do affect Amikacin disposition in children.[6] In diseases like tuberculosis, there is still debate on exact dose of Amikacin to be given in MDR TB.[7]

Due to high likelihood of nephrotoxicity once a day dose are recommended in infants.[8]

Amikacin is available as a small vial containing 1ml=250 mg of Amikacin. Small volume of injection carrying high dose of Amikacin makes it likely to administer heavy dose of medicine if not carefully calculated or monitored. A casual approach or ignorance is usually a reason for Amikacin toxicity. But it may be easily avoided by having small dose preparations in market.

The mishap explained in this case, could have been easily prevented by having precision in dose calculations, by avoiding a telephonic order, insisting a written order, not letting a junior nurse handle the dose calculations, having a weight based chart in nursing area and by having marketed preparations with low dose or infantile dose Amikacin.

This case may also make a point that single heavy dose of Amikacin need not always cause nephrotoxicity and it may be reversible without going for dialysis; provided a careful watch on renal functions is kept on 8 hourly basis. Also, this doesnot mean that single heavy dose can be ignored as there is still a chance of developing nephrotoxicity.

4. Conclusion

The above case is suggestive that Amikacin use is fairly safe and incidences of slight overdoses need not require immediate overt treatment measures if clinical parameters are within normal values. Overdose conditions thus should not evoke panic. The treatment in panic can be put on hold unless the toxic symptoms start manifesting. Regular monitoring seems more appropriate. Amikacin overdose is often a result of a casual approach by every person involved in the same.

5. Source of Funding

None.

6. Conflict of Interest

None.

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