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Moxifloxacin Induced Seizure in Traumatic Brain Injury Patients

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Abstract: ***Flouroquinolones are frequently used in treatment of upper and lower respiratory tract infections. Examples are ciprofloxacin, gemifloxacin, levofloxacin, moxifloxacin, norfloxacin and ofloxacin. Using flouroquinolones is a risk factor for drug induced seizures especially in susceptible individuals. We report two cases of moxifloxacin induced seizure which was managed successfully.***

Keywords: flouroquinolones; moxifloxacin; seizures

1. Introduction

Patients in intensive care unit (ICU) are more susceptible to pulmonary infections, either due to aspiration of gastric contents or nosocomial infection. Quinolones have a major role in the treatment of such patients.[1,2] But regardless of the beneficiary effect on the infection, they have a major side effect; seizure especially in the susceptible individuals. There have been certain previous case reports of quinolone induced seizure.[3] We report two such cases of moxifloxacin induced seizure in patients who suffered head injury.

2. Case History

Case 1- A 55 year old man was received in emergency department (ED), with history of head injury by tractor wheel. Primary resuscitation was done and airway was secured because of poor GCS-6. Then patient was shifted to ICU for further management. Non-contrast computed tomography (NCCT) revealed subdural haematoma which was evacuated on the same day. During his stay in the ICU he developed a patch in right lower lobe of lung which was evident in chest x-ray film for which intravenous (IV) moxifloxacin was added to treatment. On day-4 after addition of moxifloxacin, he developed generalized tonic clonic seizure (GTCS). The episode of seizure was terminated immediately after administration of inj midazolam 3mg IV. At the same time moxifloxacin infusion was running, so it was stopped. Arterial blood gas (ABG) analysis was done to rule out any electrolyte imbalance or gas abnormalities as a cause for seizure. Repeat NCCT scan was done to rule out any secondary intracranial insult. Other related causes for seizures were evaluated, none of them were found to be positive. Further, moxifloxacin was removed from the treatment and during his further stay in ICU, patient didn't suffered any episode of seizure. He was also receiving other medications such as cefoperazone-sulbactam, phenytoin, glycerol and pantoprazole which had not been reported to cause seizure so they were continued.

Case 2- In another case, a 20 year old male was received in emergency department (ED) with history of road traffic accident (RTA). Primary resuscitation was done and airway was secured because of poor GCS-6. Then patient was shifted to ICU for further management and monitoring. NCCT scan revealed multiple contusions in right fronto-temporo-parietal region. After few days he developed fever with leukocytosis. On clinical examination and with radiological evidence of bilateral infiltrates on chest x-ray, he was prescribed moxifloxacin and metronidazole. On day-3 after addition of moxifloxacin, patient developed status epilepticus which was terminated after giving inj midazolam 3mg IV. ABG analysis was done to rule out any electrolyte imbalance as a cause for seizure. Repeat NCCT scan was done to rule out any secondary intracranial insult. Other related causes for seizures were evaluated, none of them were found to be positive. The episode of seizure recurred, so infusion of thiopentone was started and continued for 24 hours. Further moxifloxacin was removed from the treatment and during his further stay in ICU patient didn't suffered any episode of seizure. He was also receiving other medications such as piperacillin tazobactam, leviteracetam, phenytoin, glycerol and pantoprazole which had not been reported to cause seizure so they were continued.

Both the patients were successfully shifted to the ward without any further episode of seizure.

3. Discussion

Flouroquinolones are most frequently used to treat upper, lower respiratory tract and urinary tract infection. The flouroquinolones available commercially now a days include ciprofloxacin, gemifloxacin, levofloxacin, moxifloxacin, norfloxacin and ofloxacin. These antibiotics are associated with some adverse effects.[4] These are gastrointestinal (diarrhoea, nausea and vomiting), central nervous system[5] (dizziness, headache, somnolence, agitation, delirium, confusion, acute psychosis and seizure), photosensitivity, cardiac side effects (QT prolongation, Torsades de pointes), hepatotoxicity and dysglycemias. Quinolones vary in their ability to induce seizure. Among these drugs, trovafloxacin has maximum and levofloxacin has least propensity to develop seizure. Moxifloxacin has been reported to have

intermediate role in inducing seizure. CSF levels of moxifloxacin were 34%–78% of serum levels in inflamed meninges in animal models.[6] The mechanism of precipitation of seizure is due to the attachment of quinolones to the major inhibitory neurotransmitter GABA. After that, binding of GABA to GABA-A receptor is blocked so the neurons become less polarized resulting in decreased threshold of neuron to fire. There appears to be a strong association between the similar chemical structures of certain substituents at position-7 of the quinolone nucleus and the chemical structure of GABA.[7] These quinolones appear to displace GABA or compete with GABA binding at the receptor sites within the CNS, resulting in stimulation. Various risk factors are been reported to decrease the threshold of seizure like seizure history, hypokalemia, hypocalcemia, alkalosis, renal failure, and concomitant treatment with agents that lower the seizure threshold.[8]

In both of our cases, there was history of RTA followed by head injury, yet there was no episode of seizure.

4. Conclusion

Although flouroquinolones are better agents for treatment of respiratory tract infections, but they should be used with caution in head injury patients. Risk factors for fluoroquinolones induced seizures may include head injury, seizure history, electrolyte imbalances, renal insufficiency, and concomitant treatment with agents that lower the seizure threshold. These adverse events can often be circumvented by avoiding exposure to the specific quinolone as other antimicrobial agents have fewer propensities to induce seizures.

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