Case Report

First successful clinical use of aztreonam-avibactam for the treatment of carbapenem resistant klebsiella pneumoniae urinary infection at a tertiary care centre

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Abstract

Background: Aztreonam-Avibactam (EMBLAVEOTM) was approved by U.S FDA on February 7, 2025 for complicated intra-abdominal infections caused highly resistant gram-negative microorganisms such as Escherichia coli, Klebsiella pneumoniae, Klebsiella oxytoca, Enterobacter cloacae complex, Citrobacter freundii complex, and Serratia marcescens. [1]

By administering Aztreonam and avibactam co-formulation, we can reduce the need for simultaneous infusion of the traditional ceftazidime-avibactam plus aztreonam combination to treat infections caused by carbapenem resistant Enterobacterales. For the combination to be administered, synergy test must be positive. In other words, bacterial growth must be inhibited when the drugs are used together in-vitro. E-test and disk diffusion are widely used for synergy testing, but labs often choose different methods based on laboratory resources and expertise. Because of the lack of standardized result interpretation, outcomes can vary between laboratories leading to potential inconsistencies in reporting. [2]

Key words: Aztreonam-Avibactam (EMBLAVEOTM); Urinary tract infection (UTI); Metallo-β-lactamases

1. Case Presentation

A 68-year-old male patient with a medical history of Type 2 DM and systemic HTN and previously diagnosed triple vessel disease (previous MI) with aortic valve calcification came to our hospital for CABG and aortic valve replacement. During pre-operative evaluation, he developed fever with mild dysuria with features of acute kidney injury. Detailed history-taking revealed a prior Foley catheterization in an outside hospital, which remained in situ for two days before removal. In view of fever, urinary symptoms and

pyuria on urine routine, urinary tract infection (UTI) was suspected and urine culture was sent. Subsequently, the surgery was deferred and he was started on Inj. cefoperazone-sulbactam awaiting culture reports. Carbapenem resistant Klebsiella pneumoniae was isolated in the urine culture following which, the patient was started on simultaneous infusion of Inj. Ceftazidime-Avibactam 2.5g IV TDS and Inj. Aztreonam 2g IV TDS as the isolated Klebsiella pneumoniae was resistant to ceftazidime-avibactam and aztreonam individually but the synergy test was positive. Antibiotic was changed to aztreonam–avibactam on the following day.

The availability of aztreonam-avibactam allowed us to switch to a drug with better pharmacokinetics and standardized dosing (2 g /0.67g loading dose followed by 1.5g/0.5g q6h over 3-h infusion). He completed 7-day course of antibiotics and was taken up for surgery, which was successful. He subsequently improved and was discharged.

2. Discussion

Aztreonam, a monobactam antibiotic, is active against gram-negative bacteria. It is also resistant to hydrolysis by Metallo-β-lactamases (MBLs - Ambler Class B) such as NDM, VIM an IMP. However, bacteria that produce MBLs also produce Serine β-lactamases which can hydrolyse Aztreonam. Avibactam covers this gap by taking care of Serine β-lactamases (Classes A, C, and D) such as ESBLs (Klebsiella pneumoniae carbapenemase), AmpC, Oxa-48 etc. The inherent instability of isolated avibactam necessitates the administration of ceftazidime–avibactam and aztreonam, even though ceftazidime does not provide coverage MBLs and SBLs producing gram negatives. [2]

This unnecessary use of ceftazidime can be circumvented by the use of aztreonam-avibactam. Inaccuracies in dosage and timing encountered in simultaneous administration of ceftazidime–avibactam and aztreonam can also be prevented. In addition to this, there is a the lack of standardization (lab-dependent) of synergy testing [3,4]. One possible downside to aztreonam-Avibactam is the need for loading dose which is not required in the widely used alternative.

3. Conclusion

In conclusion, aztreonam–Avibactam offers a more predictable and targeted option for treating metallo-β-lactamase–producing Gram-negative bacteria by directly protecting aztreonam from serine β-lactamase degradation without relying on an ineffective partner drug. Compared with ceftazidime–Avibactam plus aztreonam, it reduces unnecessary antibiotic exposure, simplifies dosing, and minimizes variability in clinical outcome. Given these advantages and the growing prevalence of highly resistant Gram-negative bacteria, the use of aztreonam–avibactam should be encouraged to improve the standard of care.

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