Simulation of antibiotics transport into human intervertebral disc with intravenous infusion” Zhu et al (2019).

Abstract:

STUDY DESIGN: Simulation of antibiotics transport into human intervertebral disc with intravenous infusion.

OBJECTIVE: The objective of this study was to quantitatively investigate antibiotic concentrations in the disc.

SUMMARY OF BACKGROUND DATA: Intravenous infusion of antibiotics is typically used to treat intervertebral disc infection in clinics. However, it is difficult to evaluate the drug concentrations within discs in vivo.

METHODS: A computational model was used in this study. The variation of drug charge with pH was considered in the model. Thirty-minute infusions of two commonly used antibiotics in clinic -vancomycin and cefepime - were numerically investigated. Spatial and temporal concentration distributions of these drugs in both non-degenerated and moderately degenerated discs were calculated.

RESULTS: For intravenous infusion of 1g vancomycin and 2g cefepime in 30 minutes repeated every 12 hrs, it was predicted that vancomycin concentration in the disc fluctuated between 17.0 and 31.0 times of its minimum inhibitory concentration (MIC, 1ug/ml) and cefepime concentration fluctuated between 1.1 and 4.2 times of its MIC (i.e., 8ug/ml) in about two days. It was also found that vancomycin concentration in moderately degenerated disc was lower than that in the non-degenerated disc.

CONCLUSION: This study provides quantitative guidance on selecting proper dosage for treating disc infection. The method used in this study could be used to provide quantitative information on transport of other antibiotics and drugs in discs as well.

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