Redosing antibiotics during cardiopulmonary bypass: The time is now

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Surgical site infections (SSIs) in postoperative cardiac surgical patients are devastating complications associated with increased morbidity, mortality, and cost. In a time in which outcome measures have substantial implications for reimbursement and overall consumer ratings, considerable amounts of attention and effort are paid to preventive measures. Protocol-driven perioperative antibiotic prophylaxis and stringent aseptic technique have been successful in minimizing the occurrence of SSIs; however, patients who undergo cardiopulmonary bypass (CPB) represent a unique patient population who still acquire SSIs.

Current Society of Thoracic Surgeons prophylactic antibiotic guidelines from 2007 recommend administration of a β -lactam antibiotic for standard surgical prophylaxis, with the addition of a glycopeptide in high-risk patient populations to cover methicillin-resistant *Staphylococcus aureus*.¹ These guidelines make specific recommendations for initial dosing; however, there remains uncertainty regarding appropriate redosing strategies.

It is well established that CPB increases pharmacokinetic volume of distribution as a result of hemodilution, altered protein binding, tissue distribution, and sequestration in the CPB circuit.² This effect is especially marked for hydrophilic drugs such as vancomycin and first-generation cephalosporins, including cefazolin.

In this issue of the *Journal*, Lanckohr and colleagues³ from Muenster, Germany, report the pharmacokinetics of cefazolin during cardiac surgery with CPB and the minimum inhibitory concentrations of organisms present on the patients' skin. Starting with an initial Society of Thoracic Surgeons–recommended dose of 2 g of cefazolin, they then added an additional 2-gram dose of cefazolin after initiation of CPB. After initiation of CPB but before administration of the second dose of cefazolin, cefazolin concentration fell by approximately 40%. In this small study, despite initiation of CPB, cefazolin levels were still greater than 8 mg/L in all patients,

Potential pathogens present on a child's hand. Complements of Tasha Sturm, Cabrillo College.

Central Message

Cefazolin levels decline on initiation of cardiopulmonary bypass. Redosing cefazolin after initiation of cardiopulmonary bypass increases levels.

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above the minimum inhibitory concentration of observed skin organisms. Redosing cefazolin increased median cefazolin levels to those seen after the first dose. Further, although they observed that more than 90% of pathogens on the patients' skin were sensitive to cefazolin, there is a lack of information regarding the sensitivities of the remaining pathogens and whether they would be covered by the serum levels of cefazolin observed in their patients.

An important limitation of this study is the lack of a control group that did not receive an additional dose of cefazolin on initiation of CPB. We therefore cannot be certain that cefazolin levels greater than 8 mg/L would not similarly be achieved until the next routine 3- or 4-hour dose of cefazolin. Is this a necessary study before adoption of additional cefazolin dosing and incorporation into revised Society of Thoracic Surgeons antibiotic guidelines? We think that it is not. Overall, readministration of cefazolin after CPB initiation is a low-risk, low-cost, and potentially high-benefit clinical decision in light of the grave consequences of development of SSIs. Strong consideration should be given to adopting earlier intraoperative redosing strategies for antibiotic prophylaxis in patients undergoing CPB.

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