CSHP 2015 Success Story

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Project Title: Acute Kidney Injury with Tobramycin-Impregnated Bone Cement Spacers in Prosthetic Joint Infections: A Controlled Study

Abstract:

Background: A two-stage revision is frequently employed for the treatment of infected hip or knee arthroplasties. An antibiotic-impregnated bone cement spacer (ACS) with tobramycin ± vancomycin is commonly used in the first stage of this procedure.

Objective: We investigated the incidence and risk factors for acute kidney injury (AKI) after implantation of tobramycin-impregnated bone cement.

Methods: This was a prospective, observational, controlled study of 119 patients from Aug 2011 to Feb 2013. The tobramycin group included 50 consecutive patients who received tobramycin bone cement for the first stage of revision of infected hip or knee arthoplasties. The control group consisted of 69 consecutive patients who had a routine hip arthroplasty revision without ACS. AKI was defined as an increase of 50% or greater in serum creatinine from baseline within the immediate 7-day post-operative period.

Results: The incidence of AKI was higher in the tobramycin group compared to the control group (20% vs. 4.3%, p=0.01). A multivariate analysis adjusting for potential confounders also confirmed the higher incidence of AKI in patients receiving tobramycin ACS (OR 7.2; 95% CI 1.5-33.5). Mean onset of AKI was on post-operative day 3 in both groups and patients with AKI had longer duration of hospital stay (18.6 ± 13.7 days vs 8.8 ± 7.0 days, $p < 0.0001$). Other risk factors for AKI were baseline co-morbidity (OR 6.2; 95% CI 1.3-29.1), and administration of

post-operative intravenous vancomycin (OR 5.3; 95% CI 1.6-17.7) or angiotensin converting enzyme inhibitors (ACEIs)/ angiotensin II receptor blockers (ARBs) (OR 4.0; 95% CI 1.2-13.04). Use of pre-manufactured bone cement containing gentamicin was also a risk factor in the tobramycin group (OR 4.5, 95% CI 1.1-19.3).

Conclusions: The incidence of AKI in infected hip or knee arthroplasties with tobramycin ACS was greater than in routine total hip arthoplasties. Measures to minimize AKI risk in the peri-operative period may reduce the incidence.

Alignment with CSHP 2015 Goal #4:

Our research project is an example of how our pharmacy department improved the safety of medication use in the hospital. By conducting this study, we identified that post-operative use of ACEIs/ARBs, and the use of pre-manufactured bone cement containing gentamicin were risk factors for AKI. We presented the study results to the orthopedic surgeons and they all agreed to no longer use pre-manufactured bone cement containing gentamicin in patients who will also receive added tobramycin powder. In addition, an orthopedic pre-printed order has been revised to add a section to discontinue all ACEI and ARBs for 72 hours post-operatively in patients with infected joints requiring tobramycin bone cement. Thus, we have improved the safety of medications used in this type of surgery by ensuring the acrylic polymer depot utilized to carry tobramycin does not already contain another aminoglycoside (ie. gentamicin), and by avoiding the use of ACEIs and ARBs within the first 72 hour post-operative period

Improvement in Patient Care

Our project has improved the care of patients undergoing first stage revision of an infected hip or knee arthroplasty. The development of AKI in general has been associated with increased length of hospital stay, mortality and cost. Our project identified measures that may minimize AKI risk in the peri-operative period, and our findings led to the development of a new order set.

. A follow-up study will be implemented to determine if these measures have indeed reduced the incidence of AKI in this population.