Tourniquet Use Markedly Decreases Periarticular Cefazolin Tissue Levels During Total Knee Arthroplasty: A Prospective Randomized Trial

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INTRODUCTION: Prophylactic administration of intravenous antibiotics prior to skin incision is the most important measure to prevent periprosthetic joint infection (PJI) in arthroplasty surgery. To be effective, the local tissue concentration (LTC) of the antibiotic must exceed the minimum inhibitory concentration (MIC) of the organism. The LTC of Cefazolin in periarticular tissues during total knee arthroplasty (TKA) with and without tourniquet inflation is unknown. The aim of the study was to evaluate the concentration of cefazolin in serum, as well as LTC in periarticular knee tissues during a primary TKA with or without the use of a limb tourniquet during the surgery.

METHODS:

Fifty-nine consecutive patients undergoing primary TKA were prospectively randomized to TKA with or without a tourniquet at the time of their surgery. Blood, fat, synovium and bone samples were harvested at regular intervals during the procedure. LTC of Cefazolin were quantified using liquid chromatography–tandem mass spectrometry (LC-MS) technique. A power analysis found that a total sample size of 50 patients was required. Student T-Test and Analysis of Variance were used for repeated measures of cefazolin concentration between groups. A p value of <0.05 was considered significant.

RESULTS:

In patients undergoing TKA surgery without a tourniquet, the mean concentration of Cefazolin in serum was 71.9 ug/ml whereas the LTC in fat, synovium, and bone was 13.9 ug/g, 27.7 ug/g, 17.7 ug/g, respectively. For patients undergoing TKA surgery with a tourniquet, the mean concentration of Cefazolin in serum was 72.0 ug/ml (SD 32.6) versus LTCs was 9.9 ug/g (5.7) , 21.8 ug/g (11.3), 13.0 ug/g (7.7) in the same tissues. The use of a tourniquet resulted in significantly lower LTCs in fat, synovium and bone by 60 minutes after cefazolin infusion. (Fat $p=0.001$, Synovium $p=0.03$, Bone=0.007)

DISCUSSION AND CONCLUSION:

The LTC of Cefazolin was found to be lower than that in blood and the use of a tourniquet significantly lowered the LTC of Cefazolin in fat, synovium and bone. Although the current prophylactic dosing regimen for Cefazolin provides sufficient serum concentrations, the concentrations in the periarticular tissue during TKA may be inadequate to provide the MIC necessary for the duration of the surgery to be effective in preventing PJI.