The Effect of Local Anesthetics Administered Via Pain Pump on Chondrocyte Viability

Reference:

Scientific Literature Review

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Podiatric Relevance:  
Pain management is an art the Podiatric surgeon must master. The comfort of a patient is prime importance in the post-operative setting. Although opioids have the highest efficacy for pain management, they can have many adverse effects, including addiction. Alternative pain control methods are available including local anesthetic pain pumps. Recent research has eluded to the risk of chondrolysis associated with the use of pain pumps. The purpose of this study is to evaluate the in vitro chondrotoxicity of anesthetic formulation used in pain pumps.

Methods:  
This controlled laboratory study that used human articular cartilage samples obtained during total knee arthroplasties. To mimic the metabolism of synovial fluid, the human articular chondrocytes were cultured for 24-, 48 and 72 hours trials in a custom bioreactor. The chondrocytes were then perfused with DMEM-10% FBS and one of the following medications: 1% lidocaine, 1% lidocaine with epinephrine, 0.25% bupivacaine, 0.25% bupivacaine with epinephrine, 0.5% bupivicaine and 0.5% bupivicaine with epinephrine. In addition a control group was created using perfusion cultures and growth media. Fluorescent microscopy and histomorphometry was used to assess the ratio of dead to live cells.

Results:  
Two-way analysis of variance ANOVA and Dunnett’s multiple comparison methods were used to determine the P values. A significant increase of chondrocyte death was seen in all cultures involving local anesthetics with epinephrine at all time intervals. At 48 hours, 0.25% bupivacaine had the most cell viability. At 72 hours, 0.5% bupivicaine had the most chondrocyte necrosis.

Conclusions:  
This study highlights the possibility of early degenerative joint disease and increased complication with the use of pain pumps. This study shows that the use of 0.25% bupivacaine plain for 48 hour would be a safer choice. Podiatric surgeons can use this study’s findings to help find the appropriate local anesthetic concentration and duration of use in the post-operative setting.