

The Effect of Tourniquet Use and Sterile Carbon Dioxide Gas Bone Preparation on Cement Penetration in Primary Total Knee Arthroplasty

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Abstract

Background: Tourniquetless total knee arthroplasty (TKA) is experiencing resurgence in popularity due to potential pain control benefits. Furthermore, optimal cement technique and implant fixation remain paramount to long-term cemented TKA success, as aseptic loosening continues to be a leading cause of revision. The purpose of this study is to determine how tourniquet use and/or novel bone preparation using sterile, compressed carbon dioxide (CO₂) gas affected cement penetration in TKA.

Methods: A retrospective review was performed on 303 consecutive primary TKAs with the same implant in 3 groups: (1) a tourniquet without sterile CO₂ compressed gas used for bone preparation, (2) no tourniquet with CO₂ gas, and (3) tourniquet use and CO₂ gas bone preparation. Cement penetration was measured on radiographs by two independent, blinded raters across 7 zones defined by the Knee Society Radiographic Evaluation System.

Results: The 3 groups did not differ on age, body mass index, or gender ($P \geq .1$). Cement penetration was greater in 6 of 7 zones with significantly greater cement penetration in 3 zones (tibial anteroposterior zone 2, femoral lateral zones 3A and 3P) in groups that utilized CO₂ gas bone preparation compared to the tourniquet only group ($P \leq .039$).

Conclusion: Bone prepared with CO₂ gas showed significantly more cement penetration in 3 zones with greater cancellous bone. The results suggest that use of CO₂ gas bone preparation may achieve greater cement penetration than using a tourniquet with lavage only.

Keywords: Radiographic Evaluation System; bone preparation; cement penetration; total knee arthroplasty; tourniquet.

