INTRODUCTION:
Ulnar impaction syndrome is commonly the result of an ulnar positive condition secondary to malunion of a distal radius fracture or collapse of a fractured radial head. The Feldon wafer procedure and distal hemiresection procedure are designed to reduce force transmitted through the distal ulna. The purpose of this study was to measure the effects of these procedures on distal ulnar loading with varying degrees of ulnar positivity.

METHODS:
Using a specially designed miniature load cell, distal ulnar force was measured in twenty fresh frozen cadaveric forearms as the wrist was loaded axially to 134N in neutral rotation; the elbow was in valgus alignment. Ulnar positivity (0mm to +6mm) was created by incremental shortening of the distal radius using a sliding plate. Loading tests were repeated after removal of a 3mm wafer of bone beneath the triangular fibrocartilage complex, and again after a hemiresection to the base of the styloid process. A one-way repeated measures analysis of variance model was used to determine the significance of differences between mean distal ulnar forces between test conditions. Multiple pairwise comparisons between means were made using the Student Neuman Keuls procedure. The level of significance was p < 0.05.

RESULTS:
For the presentation of results which follows, the 0mm condition indicates no ulnar variance, while plus values indicate the amount of positive ulnar variance (in millimeters). Mean distal ulnar force generally increased as the wrist became more ulnar positive; this was true before and after both surgical procedures (Figure 1). Both wafer removal and hemi-resection significantly decreased mean distal ulnar forces under all conditions of ulnar variance (Figure 1).

Mean distal ulnar forces for the 0mm condition (expressed as a percentage of applied wrist force) were 16.8% (intact), 3.8% (wafer), 3.5% (hemi); force reductions with both procedures were significant and statistically equal (Figure 1). Corresponding means with ulnar positive wrist conditions were: 33.6%, 9.8%, 3.8% [+2mm], 51.6%, 22.9%, 8.9% [+4mm], and 61.6%, 39.8%, 15.1% [+6mm] (Figure 1). The reduction in distal ulnar force resulting from hemiresection (expressed in the units "percentage of applied wrist force") was significantly greater than that for wafer removal for all ulnar positive conditions (Figure 2).

DISCUSSION:
Both procedures produced equal reductions in distal ulnar force when the wrist was ulnar neutral. The hemiresection was a more effective procedure when the wrist was ulnar positive. Assuming a target level of 16.8% (0mm intact condition), force levels after wafer removal remained significantly higher than 16.8% for +4mm and +6mm conditions. In contrast, force levels after hemiresection were significantly lower than or statistically equivalent to 16.8% for all ulnar variance conditions.