Smoking and other associated risk factors for delayed union and nonunion following ulnar shortening osteotomy

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Objective

• To investigate the effect of smoking and other potential risk factors on time to bony union and incidence of non-union following ulna shortening osteotomy (USO) using a dedicated osteotomy plating system.

Methods

• Retrospective review of patients who underwent USO with TriMed single osteotomy dynamic compression plating system (TriMed, Santa Clara, CA) from 2010-4
• All surgeries performed by the two senior authors (SMJ, EKS)
• Data queried: Demographics, medical co-morbidities, detailed smoking history including # of PPD smoked, length of shortening of the ulna, EtOH use
• Radiographs reviewed by a blinded (fellowship-trained hand surgeon) author to determine union time
• Bivariate statistical analysis:
  • Independent t-test for comparison of time to union time between dichotomous variables (i.e. smokers vs. non-smokers, diabetics vs. non-diabetics, etc.)
  • Chi-square test for incidence of union versus delayed or nonunion and same variables
• Binary logistic regression model developed using significant predictors from bivariate analysis

Results

Study Cohort

• 72 USOs (69 patients)
• 42 female, 27 men
• Mean age: 44 +/- 12 years
• Mean time to union 4 +/- 2 months
• 17 smokers

Bivariate Analysis

• Time to union
  • 3 +/- 1 non-smokers
  • 6 +/- 3 smokers \( P = 0.001^* \)

• Incidence of delayed union/nonunion
  • 4% in non-smokers
  • 59% in smokers \( P < 0.001^* \)
  • 14% in non-diabetics
  • 38% in diabetics \( P = 0.09 \)

Multivariate Analysis

Smoking (Odds ratio = 65) and diabetes (OR = 13)

significant \( (P = 0.000) \); predicted 90% of outcomes

(union versus delayed or nonunion)

Nonunions

• 3 of 4 occurred in active smokers, all requiring revision plating and bone grafting and healed in delayed fashion;
• 1 non-smoker developed nonunion secondary to hardware failure due to early ambulation on her operative arm, was treated with exchange of loose screws and did well subsequently

Conclusions

• Despite the use of an osteotomy-specific plating system, smokers and diabetics remain at a significantly higher risk for both delayed union and nonunion following elective ulnar shortening osteotomy.
• Smokers in particular should be counseled on methods for cessation, with emphasis placed on the prolonged post-operative course likely to occur if they are unable to quit smoking.