Super Diabetes: Complications of Significantly Elevated HbA1c in Ankle Fracture

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Purpose: Our objective was to investigate what threshold of hemoglobin A1C (HbA1c) is associated with increased risks of postoperative complications in patients who carry a diagnosis of diabetes mellitus and who underwent open reduction and internal fixation for ankle fractures.

Methods: This retrospective review of an IRB-approved database of 175 patients with ankle fractures demonstrated 36 (20.6%) who sustained an ankle fracture and who had a HbA1c of above 6.5 upon admission to the hospital. Data collected on patients included demographics, past medical history, fracture classification, surgical fixation, and clinical outcomes including wound healing, surgical site infection, and reoperation. Patients were divided into two cohorts with HbA1c of 8.5 serving as the cut-off. Patients were then divided into three groups with a medium HbA1c group less than 8.5, high HbA1c group 8.6 to 12.9, and very high HbA1c group >13. $\chi 2$ tests of homogeneity and binomial logistic regressions were completed using IBM SPSS to compare outcomes between the cohorts.

Results: The average HbA1c within the total cohort was 9.0 ± 2.3. Increasing HbA1c levels were correlated with increased likelihood of developing wound complications, including both superficial and deep wound infections. Patients with HbA1c levels >8.5 were 6.6 times more likely to develop wound complications than patients with HbA1c levels of ≤8.5 (P = 0.011). When the cohort was divided into three subgroups patients were 5.0 times as likely to develop wound complications (P = 0.011) and, specifically, 4.5 times as likely to develop deep infections (P = 0.022) as their HbA1c transitioned from group 1 to group 3. There were no significant differences in patient demographics, injury characteristics, 90-day hospital readmission, or reoperations among cohorts (Table 1).

Conclusion: Increasing HbA1c is associated with increased complications after ankle fracture fixation with 8.5 as the cut-off. The risk of complications incrementally increases as HbA1c increases above 6.6.

Demographic, Injury, and Outcome Characteristics with HbA1c 8.5 as Cutoff			
	HbA1c ≤ 8.5 (N=20)	**HbA1c > 8.5 (N=16)**	***p*-value**
Mean Age, yrs (±SD)	60.5 (±11.1)	54.9 (±11.8)	0.165
Mean BMI (±SD)	31.6 (±5.9)	30.5 (±5.3)	0.582
Mean CCI, yrs (±SD)	1.7 (±1.0)	1.7 (±1.6)	0.355
Mean Glucose Level on Admission (±SD)	149.9 (±34.7)	205.5 (±98.4)	0.029
Open Wound Status	5 (25.0%)	6 (37.5%)	0.418
Wound Complication	5 (25.0%)	11 (68.8%)	0.009
Superficial Infection	4 (20.0%)	6 (37.5%)	0.049
Deep Infection	2 (10.0%)	5 (31.3%)	0.439
90-Day Hospital Readmission	4 (20.0%)	7 (43.8%)	0.124
Reoperation	4 (20.0%)	8 (50.0%)	0.058