Association Between Hemoglobin A1c and Postoperative Infections in Elective Hand Surgery

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INTRODUCTION:

Despite the prevalence of diabetes, the literature guiding surgical management of elective hand surgeries based on HgbA1c is limited. Therefore, this study investigates the association of risk factors with infection following elective hand surgery among patients within the Veterans Health Administration with diabetes.

METHODS:

The Veterans Health Administration electronic health record was queried for patients with diabetes who underwent elective hand surgery and had an HgbA1c value within one year of surgery. Patients were stratified by HgbA1c and also by the number of comorbidities. Postoperative infection was determined by searching for ICD codes or the prescription of antibiotics within 30 days of surgery. Fisher's exact test, Chi-squared tests, and t-tests assessed an unadjusted association of risk factors with infection, and then logistic regression adjusted the model for relevant covariates.

RESULTS:

Evaluation of 492 patients with 669 different surgical dates and 811 surgeries demonstrated an infection rate of 11.1%. Higher HgbA1c levels, longer surgery length, male gender, insulin use, undergoing more than one surgery, more than three comorbidities in addition to diabetes, and the presence of CAD, COPD, or CHF were statistically associated with an increased risk of infection. Specifically, logistic regression with HgbA1c as a categorical variable revealed that HgbA1c of 8.0% or more was statistically significant for increased risk of infection (OR = 2.4). Additionally, a logistic regression of the number of comorbidities found an increased risk of infection with 4-5 comorbidities (OR = 1.9) and further increased risk with 6-7 comorbidities (OR = 3.5).

DISCUSSION AND CONCLUSION:

The risk of infection after elective hand surgery in patients with diabetes increases with a higher HgbA1c value. Therefore, based on the logistic regression models, a threshold of HgbA1c of 8.0% is recommended to potentially decrease the risk of a postoperative infection, especially in patients with multiple comorbidities.

Table 3. Results of Logistic Regression Model 1

Variable of Interest	OR [95% conf limits]	p-value
CHF diagnosis	3.5 [1.58, 7.7]	0.002
COPD diagnosis	1.9 [1.04, 3.6]	0.039
HbA1c, by category		
< 6.0%	0.48 [0.21, 1.09]	0.078
6.0 − 6.9%	Ref	--
7.0 − 7.9%	Not Significant	--
>= 8.0%	2.4 [1.21, 4.6]	0.011
>1 Surgery on a specific date	2.1 [1.17, 3.6]	0.012

Table 2. Comparisons of Variables of Interest by Surgery Outcome

Measurement	Infection Occurred	No Infection	p-value
Age, years	61.9	61.7	0.89
HbA1c, pre-surgery, %	7.2	6.8	0.017
BMI	32.2	33.0	0.26
Surgery Length, min	81.0	54.4	<0.001
Estimated blood loss, mL	17.6	10.1	0.10
	Infection Rate		**p-value**
Male (n=608)	11.8%		0.05
Female (n=61)	3.3%		
Ethnicity/Race			
Hispanic (n=188)	11.2%		
Black (n= 59)	10.0%		0.67
White (n=349)	15.3%		
Other (n= 73)	12.3%		
HbA1c, by category			
< 6.0% (n=133)	6.0%		
6.0 − 6.9% (n=293)	11.3%		0.001
7.0 − 7.9% (n=166)	9.0%		
>= 8.0% (n= 77)	23.4%		
Diabetes Complications (n=111)	12.6%		0.33
No Complications (n=558)	10.8%		
Uses Insulin (n=162)	15.4%		0.032
No Insulin within 1 yr (n=507)	9.7%		
Used Steroids (n= 32)	21.9%		0.053
No Steroids within 90 d (n=637)	10.5%		
Alcohol Dependency (n= 88)	14.8%		0.16
No Alc. Dependency (n=581)	10.5%		
Nicotine Dependency (n=150)	8.7%		0.89
No Nic. Dependency (n=519)	11.8%		
Drug Dependency (n= 37)	16.2%		0.22
No Drug Dependency (n=632)	10.8%		
Number of Surgery Codes			
1 (n=545)	9.4%		0.004
2-5 (n=124)	18.6%		
Number of Comorbidities			
0-1 (n=109)	10.1%		
2-3 (n=436)	8.9%		0.006
4-5 (n=102)	17.7%		
6-7 (n= 22)	27.3%		
Hypertension (n=600)	11.2%		0.50
Absent (n= 69)	10.1%		
Hyperlipidemia (n=547)	11.7%		0.17
Absent (n=122)	8.2%		
CAD (n=184)	15.8%		0.014
Absent (n=485)	9.3%		
COPD (n= 97)	17.5%		0.026
Absent (n=572)	10.0%		
CKD (n= 73)	13.7%		0.28
Absent (n=596)	10.7%		

Table 4. Results of Logistic Regression Model 2

Variable of Interest	OR [95% conf limits]	p-value
Number of Comorbidities		
0-1	Not Significant	--
2-3	Ref	--
4-5	1.9 [1.01, 3.6]	0.048
6-7	3.5 [1.25, 9.9]	0.017
HbA1c, by category		
< 6.0%	0.48 [0.21, 1.09]	0.079
6.0 − 6.9%	Ref	--
7.0 − 7.9%	Not Significant	--
>= 8.0%	2.3 [1.17, 4.4]	0.015
>1 Surgery on a specific date	2.2 [1.28, 3.9]	0.005
Used Steroids	2.4 [0.95, 5.9]	0.064