

Hemoglobin A1c as a predictor of surgical site infection following single level lumbar/lumbosacral posterior fusion in patients with diabetes

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Diabetes mellitus (DM)

- Prevalent chronic disease of glucose dysregulation
- Increase multiple postoperative complications
- Independent risk factor for SSI after spinal surgery

Surgical site infection (SSI)

- One of the most common and serious complications after spinal surgery
- Increase the morbidity, mortality, length of hospital day, readmission, and health care costs

Glycated hemoglobin (HbA1c)

- Measuring to identify the 3-month average plasma glucose concentration
- Ubiquitously used for monitoring effective glycemic control in diabetes care

Goals of the present study

To evaluate the association of preoperative glycemic control as demonstrated by HbA1c in DM patients with the incidence of surgical site infection following single level lumbar/lumbosacral posterior fusion

To calculate a threshold level of HbA1c above which the risk of postoperative infection after spinal fusion increases significantly in patients with diabetes

Diagnosis of surgical site infection

- Defined according to the guidelines published by the CDC in 2014 (superficial incisional / deep incisional / organ-space)
- Laboratory studies were also referenced (e.g. prolonged elevation C-reactive protein value)
- Event occurs within 90 days after operative procedure

Result

S group : surgical site infection group (n=24)

NS group : non surgical site infection group (n=68)

Material and method

Retrospective study

From January 2009 to December 2015 92 patients were enrolled

Inclusion criteria

Single-level lumbar/lumbosacral posterior fusion
Patients with confirmed diabetes mellitus
Conventional open surgery

Operative technique

- PLF or PLIF with instrumentation
- fused segment : only single level of L4-5 or L5-S1
- excluded minimally invasive spine surgery

Preoperative HbA1c value

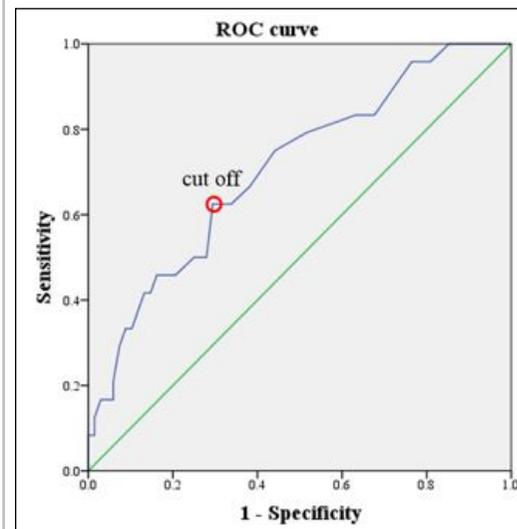
- Measured within 4 weeks before surgery during preoperative medical examination.
- Recorded as a percentage (by NGSP: National Glycohemoglobin

Table 1 Demographic and clinical characteristics of study groups^{a)}

	S group ^{b)}	NS group ^{b)}	P-value ^{c)}	
No. ^{a)}	24 ^{a)}	68 ^{a)}	^{a)}	
Sex (M:F) ^{a)}	13:11 ^{a)}	25:43 ^{a)}	0.137 ^{a)}	
Age (years) ^{a)}	70.0 ± 8.4 ^{a)}	66.7 ± 8.6 ^{a)}	0.108 ^{a)}	
Smoking ^{a)}	7 ^{a)}	16 ^{a)}	0.583 ^{a)}	
BMI (kg/m ²) ^{a)}	25.71 ± 4.66 ^{a)}	24.96 ± 3.44 ^{a)}	0.404 ^{a)}	
HbA1c (%) ^{a)}	6.8 ± 1.3 ^{a)}	6.0 ± 0.8 ^{a)}	0.008 ^{a)}	
Hospital stay (days) ^{a)}	45.8 ± 39.7 ^{a)}	19.3 ± 7.5 ^{a)}	0.003 ^{a)}	
Follow-up duration (months) ^{a)}	25.0 ± 13.8 ^{a)}	21.8 ± 9.0 ^{a)}	0.190 ^{a)}	
ASA physical status classification ^{a)}	^{a)}	^{a)}	0.206 ^{a)}	
	2 ^{a)}	18 ^{a)}	^{a)}	
	3 ^{a)}	59 ^{a)}	^{a)}	
Procedure ^{a)}	^{a)}	^{a)}	0.768 ^{a)}	
	PLF ^{a)}	6 ^{a)}	15 ^{a)}	^{a)}
	PLIF ^{a)}	18 ^{a)}	53 ^{a)}	^{a)}
Fusion segment ^{a)}	^{a)}	^{a)}	0.483 ^{a)}	
	L4/5 ^{a)}	17 ^{a)}	53 ^{a)}	^{a)}
	L5/S1 ^{a)}	7 ^{a)}	15 ^{a)}	^{a)}
Transfusion ^{a)}	3 ^{a)}	7 ^{a)}	0.717 ^{a)}	
EBL (mL) ^{a)}	483.3 ± 312.7 ^{a)}	459.6 ± 229.7 ^{a)}	0.694 ^{a)}	
Operation time (min) ^{a)}	272.9 ± 45.7 ^{a)}	266.7 ± 42.1 ^{a)}	0.544 ^{a)}	

The preoperative HbA1c value was significantly higher in S group (6.8%) than in NS group (6.0%; p=0.008)

Three of the 24 (12.5%) patients developed SSI of the deep layer requiring operative irrigation and debridement.



Receiver operating characteristic (ROC) analysis

HbA1c = 6.9 % could serve as a threshold for significantly increased risk of SSI (p=0.003, AUC=0.708, sensitivity=62.5%, specificity=70.6%)

Multivariable binomial logistic regression analysis

- controlling for numerical confounding factors / stepwise variable selection
- the threshold HbA1c value by ROC was significantly associated with postoperative infection (p=0.008, OR=4.500, 95% CI=1.486-13.624)

Conclusions

In patients with diabetes, the preoperative glycemic control as indicated by HbA1c is an independent risk factor for SSI following single level lumbar/lumbosacral posterior fusion

ROC analysis determined that a preoperative HbA1c above 6.9% could serve as a threshold value for a significantly increased risk of postoperative wound infection