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Surgical Apgar Score (SAS) Predicts Perioperative Morbidity and Length of Stay in Patients Undergoing Esophagectomy at a High-Volume Center

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Background/Methods

Background

Esophagectomy is a procedure that carries considerable morbidity. Many studies have evaluated factors to predict patients at risk and improve clinical outcomes. The aim of this study was to determine whether the SAS predicts complications, length of stay, and anastomotic leak for patients undergoing esophagectomy at a high-volume institution.

Methods

We evaluated 212 patients undergoing successful esophagectomy between January 2005 and April 2014. Postoperative complications were graded using a modification of the Clavien-Dindo scale[1], and the SAS (range 0-10), modified from Gawande et al. [2], was determined. Association of SAS with incidence of anastomotic leak and complications was evaluated using the Cochran Armitage trend test between grouped SAS scores (0-2, 3-4, 5-6, 7-8, 9-10) and each of the outcomes. Correlation of Apgar score with length of stay was evaluated using competing risks proportional hazards regression.

Table 1. Patient characteristics, procedures, and 30-day outcomes

	n (range or %)
Preoperative variables:	
No. of included patients	212
Age (mean (years))	63.5 (31-86)
Gender (male)	175 (82.5)
ASA (mean)	2.86 (2-4)
Intraoperative variables:	
Lowest heart rate (mean (beats/min))	58.7 (20-105)
Lowest mean arterial pressure (mean (mmHg))	54.6 (30-85)
Estimated blood loss (mean (mL))	300.0 (50-4000)
Operative duration (mean (min))	445.4 (156-738)
Operative Procedures:	
Open	84 (39.6)
Minimally Invasive Esophagectomy	128 (60.4)
Postoperative outcomes:	
No complications	83 (39.2)
Minor complications (Clavien 1,2)	62 (29.2)
Major complications (Clavien 3,4)	56 (26.4)
Deaths (Clavien 5)	11 (5.2)

Table 2. The 10-point surgical Apgar score modified for esophagectomy

	0 points	1 point	2 points	3 points	4 points
EBL (mL)	>400	201-400	100-200	<100	--
Lowest MAP (mmHg)	<40	40-54	55-69	≥70	---
Lowest HR (beats/min)	>85	76-85	66-75	56-65	≤55

Table 3. Incidence of anastomotic leak and complications by surgical Apgar score category

Surgical Apgar Score	n	n (%) with Anastomotic Leak	n (%) with Grade 2 or Higher Complication	n (%) with Grade 3 or Higher Complication	n (%) with perioperative death
0-2	5	2 (40)	5 (100)	3 (60)	1 (20)
3-4	23	6 (26)	17 (74)	15 (65)	4 (17)
5-6	81	12 (15)	81 (56)	27 (33)	5 (6)
7-8	96	17 (18)	43 (45)	22 (23)	1 (1)
9-10	7	1 (14)	1 (14)	0 (0)	0 (0)
Trend test p-value		0.29	0.0002	<0.0001	0.0006

Table 4. Median length of hospital stay (from nonparametric cumulative incidence estimate)

Surgical Apgar Score	Median LOS (days)
ALL	18.5
0-2	20
3-4	16
5-6	10
7-8	9
9-10	8
Trend test p-value	<0.0001

Results

- The average patient age was 63.5 years (range 31-86), and the average blood loss was 300 mL (range 50-4000). The median length of stay was 18.5 days (Table 4).
- There was a significant association between SAS and Grade 2 or higher (p= 0.0002) and Grade 3 or higher (p<0.0001) complications, but not with anastomotic leak (p=0.29) (Table 3).
- The perioperative mortality rate was 5.2% (n=11) with lower SAS being associated with greater mortality (Table 3).
- Length of stay was also associated with SAS (p<0.0001) with higher scores being associated with shorter length of stay (Table 4).
- Minimally-invasive esophagectomy was associated with a lower rate of anastomotic leak (p=0.0047) and of Grade 3 or higher complication (p=0.0071), independent of SAS.
- Adjustment for age did not change the significance of the associations.

Conclusions

- We demonstrate that SAS is a significant predictor of complications and length of stay for patients undergoing esophagectomy.
- The SAS should be used to identify patients at lower risk in order to prioritize use of postoperative critical care beds and hospital resources.

References

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