Vacuum Assisted Closure Reduces Surgical Site Infections and Return to Operating Room in Trauma Patients Undergoing Posterior Spinal Fusion

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INTRODUCTION:
Surgical site infection (SSI) is a significant complication of posterior spinal fusion surgery (PSF). Vacuum assisted closure (VAC) has been proposed as a post-operative dressing to increase local blood flow and granulation tissue formation to promote healing. However, the efficacy of infection prevention in PSF has not been well established.
METHODS:
We retrospectively collected data from 264 consecutive trauma patients who underwent PSF performed by a single surgeon. Patient-related demographics, pertinent past medical history, medication usage, and operative factors were included in the analysis. Primary outcomes were SSI, readmission for infection, and wound-related return to the OR within 90 days of surgery.
RESULTS: Patients treated with VAC were more likely to be older (p=0.015), have diabetes (p=0.041), and undergo fusion > 5 levels (p=0.002). Infection was more common in those having been treated with standard dressing (18%, 29/157) when compared to those treated with VAC (9%, 10/107). Factors associated with increased risk of SSI included BMI ≥ 30 (p=0.006) and fusion ≥ 5 levels (p=0.016). Cancer also appeared to be approaching significance for increased risk of SSI (p=0.061). In our multivariate regression model, VAC was independently associated with reduced infection (p=0.023) and reduced return to the OR (p=0.031).
DISCUSSION AND CONCLUSION:
VAC is associated with significantly lower SSI rates and rates of returning to the OR for wound washout. This suggests that incisional wound vacuum placement in trauma patients undergoing PSF is protective against infection and reoperation.

Table 1. Demographics, clinical characteristics, and postoperative outcomes of patients undergoing surgical intervention stratified by use of wound vacuum. Comparisons of sample means were performed with statistical t-tests and comparison of categorical variables were made using chi-squared testing.

Variable	Overall (n=264)	No WV (n=157)	WV (n=107)	P
Age	51.9 (IQR: 37.0-65.0)	49.6 (IQR: 33.0-64.0)	55.3 (IQR: 45.0-68.0)	**0.015***
Male	198 (75%)	113 (72%)	85 (79%)	Ref
Race				
White	183 (69%)	114 (73%)	69 (64%)	Ref
Black	62 (23%)	32 (20%)	30 (28%)	0.138
Other	18 (7%)	10 (6%)	8 (7%)	0.574
Diabetes	71 (27%)	35 (22%)	36 (34%)	**0.041***
Active smoker	92 (35%)	61(39%)	31 (29%)	**0.098****
Cancer	8 (3.0%)	5 (3.2%)	3 (2.8%)	0.859
Chemotherapy	6 (2.3%)	3 (1.9%)	3 (2.8%)	0.633
Antibiotics	10 (3.8%)	7 (4.4%)	3 (2.8%)	0.489
Steroids	1 (0.003%)	0	1 (0.01%)	-
Hemoglobin	11.8 (IQR:10.2-13.4)	11.8 (IQR: 10.4-13.3)	11.8 (IQR: 24.4-35.0)	0.981
BMI ≥ 30	28.8 (IQR: 23.1-33.0)	27.9(IQR:22.8-31.9)	30.0 (IQR:24.4-35.0)	**0.020***
≥ 5 levels of surgery	67 (25%)	29 (18%)	38 (36%)	**0.002***
Minimally invasive approach	42 (16%)	33 (21%)	9 (8%)	0.185
Infection	39 (15%)	29 (18%)	10 (9%)	-
Readmission	15 (6%)	11 (7%)	4 (0.04%)	-
Return to OR	12 (4.5%)	10 (6%)	2 (0.02%)	-

* Statistically significant variable; ** Variable approaching statistical significance. WV-wound vacuum; OR-operating room

Table 2. Regression bivariate modeling of infection outcomes

Variable	HR	CI 5%	CI 95%	P
Age > 65	1.175	0.585	2.36	0.651
Male sex	0.631	0.336	1.271	0.211
Race				
White	Ref	Ref	Ref	-
Black	0.417	0.163	1.068	**0.068****
Other	0.283	0.039	2.066	0.213
Diabetes	1.547	0.804	2.977	0.191
Active smoker	0.818	0.415	1.615	0.563
Cancer	3.081	0.949	10.01	**0.061****
Chemotherapy	2.768	0.666	11.49	0.161
Antibiotics	0.666	0.091	4.851	0.688
BMI ≥ 30	2.459	1.299	4.655	**0.006***
Minimally invasive approach	1.636	0.776	3.447	0.195
WV	0.483	0.236	0.992	**0.047***
≥ 5 levels of surgery	2.198	1.161	4.161	**0.016***

* Statistically significant variable; ** Variable approaching statistical significance. WV-wound vacuum; OR-operating room; BMI – body mass index

Table 3. Regression multivariate modeling of infection outcome

Variable	HR	CI 5%	CI 95%	P
Age > 65	0.746	0.344	1.618	0.458
Male	0.447	0.220	0.910	**0.026***
Black	0.429	0.163	1.127	**0.086****
Cancer	2.114	0.645	6.927	0.216
BMI ≥ 30	2.002	1.043	3.834	**0.037***
WV	0.397	0.179	0.880	**0.023***
≥ 5 levels of surgery	2.465	1.218	4.987	**0.012***

* Statistically significant variable; ** Variable approaching statistical significance. WV-wound vacuum; BMI – body mass index