Reduced Rate of Surgical Site Infections following Cervical and Lumbar Spine Surgery using an Enhanced Prophylaxis Protocol

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Introduction

- Surgical Site Infections (SSI) remain a relatively common complication after spine surgery, and can lead to pain-related outcomes, increased morbidity, mortality, length of stay, readmission rate, hospital costs, and the need for additional surgical procedures. (1-4)
- Reported rates of SSI vary among different patient populations, procedures, surgeons, and surgical approaches. (6)
- SSI can increase the cost of care up to four times the cost of the initial spine surgery, ranging from $15,800 to $43,900 (5)
- Studies have shown the effectiveness of antimicrobial prophylaxis in spinal surgery. (7)
- In this study, we evaluate the the incidence of postoperative SSI following spine surgery performed by a single neurosurgeon at a single institution before and after the use of an enhanced prophylaxis protocol.

Objective

- To determine if an enhanced prophylaxis protocol can reduce the rate of SSI as compared to the standard institutional protocol.

Methods

- This IRB approved retrospective study analyzed the incidence of postoperative SSI following spine operations in which the subject received either the routine institutional prophylaxis protocol (“standard protocol”) or the enhanced prophylaxis protocol (“enhanced protocol”). [Figure 2]
- From October 1, 2001 to November 30, 2005, patients undergoing spine surgery received the standard protocol. From December 1, 2005 to March 31, 2014, patients undergoing spine surgery received the enhanced protocol.
- Inclusion criteria were patients of the senior author receiving cervical, thoracic, or lumbar surgical operations under the stated date restrictions.
- Exclusion criteria included patients with primary infections prior to surgery.

Figure 1. Patient demographics

	Standard Protocol Patients (n=394)	Enhanced Protocol Patients (n=1092)
Mean Age (years)	51.2	56.9
% Male	57.9	50.6
Mean BMI	26.88	27.65
Mean ASA Status	2	2.5

Figure 2. Standard and Enhanced Prophylaxis Protocol Components

Indication	Standard Protocol	Enhanced Protocol
Patient Scrub Preparation	Standard betadine/iodine scrub/paint Select Use of alcohol pads	1) 3 betadine scrub brushes 2) 6 alcohol wipes on incision area 3) Betadine ointment application
Alcohol Pad Preparation	Select Use	Regular Use
Patient Prep Performance	Select Attending performance	Regular Attending performance
Pulse Irrigator	Select use	Regular use for posterior instrumentation
Plastic Surgery Closure/Involvement	Select use	Regular use for high risk patients: 1) Posterior-Approach Procedures 2) Reoperations
Surgical Drains	Select use	Regular use
Prophylactic Antibiotic Coverage (unless allergic)	IV Cefuroxime Select use of IV Vancomycin	Regular use for posterior instrumentation: 1) IV Cefuroxime for 24 hours 2) IV Vancomycin until drain removal Non-instrumentation cases 1) IV Cefuroxime

Figure 3. Incidence of SSI among spine surgical procedures using an standard protocol versus an enhanced protocol (n=1486)

Operative Region	Standard Protocol		Enhanced Protocol		Total	
	Cases (% Total)	Infections (%)	Cases (% Total)	Infections (%)	Cases (% Total)	Infections (%)
Cervical	164 (41.6)	4 (2.44)	532 (48.7)	0	696 (46.8)	4 (0.57)
Thoracic	57 (14.5)	2 (3.51)	90 (8.3)	0	147 (9.9)	2 (1.36)
Lumbar	173 (43.9)	3 (1.73)	470 (43.0)	0	643 (43.4)	3 (0.47)
Total	394 (100)	9 (2.28)	1092 (100)	0	1486 (100)	9 (0.61)

The rate of SSI using the enhanced protocol was significantly reduced as compared to the standard protocol *(p<0.003), **(p<0.02), ***(p<0.0001).

Figure 4. Microbiology identified from surgical wounds

Case	Operative Region	Organisms Detected
1	Cervical	Methicillin-resistant *Staphylococcus aureus*
2	Cervical	Methicillin-susceptible *Staphylococcus aureus*
3	Cervical	Coagulase-negative *Staphylococcus* *Escherichia coli*
4	Cervical	Coagulase-negative *Staphylococcus* *Pseudomonas aeruginosa* *Staphylococcus epidermidis*
5	Thoracic	Methicillin-resistant *Staphylococcus aureus* *Staphylococcus epidermidis*
6	Thoracic	Methicillin-resistant *Staphylococcus aureus*
7	Lumbar	Methicillin-resistant *Staphylococcus aureus*
8	Lumbar	Methicillin-resistant *Staphylococcus aureus*
9	Lumbar	Methicillin-resistant *Staphylococcus aureus*

Results

- 9 cases met the criteria for SSI as determined by the CDC.
- Each SSI occurred prior to the use of the enhanced protocol
- The incidence of SSI was statistically reduced from 2.28% to 0% (p<0.0001). [Figure 3]
- All cases of SSI were observed after a posterior approach. For the posterior cases, the enhanced protocol significantly reduced the rate of SSI for cervical (p<0.004), lumbar (p<0.012), and total number of cases (p<0.0001).
- 6 of the 9 infected patients grew Methicillin Resistant Staphylococcus aureus from the surgical wounds. [Figure 4]
- Preliminary analysis shows no difference in mean age or sex between SSI and non-SSI patients. [Figure 1]
- The mean BMI for infected patients was 29.9 kg/m2 compared with 27.3 kg/m2 for uninfected patients.
- The mean ASA physical status classification system for SSI patients was 2.88 compared with 2.25 for non-SSI patients.

Discussions

- The enhanced protocol statistically reduced the rate of SSI when compared to the standard protocol.

Discussions (con't)

- The total observed SSI of 0.61% compares favorably to the national cited average of 1-11%. (6)
- Additional analysis will evaluate the role of specific components of the enhanced protocol that may be responsible for reducing SSI rates following spinal surgery.
- Through analysis of patient risk factors and protocol components, we hope to develop expected infection rates for specific patient populations and surgical procedures.

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