Surgical Site Infection Following Posterior Instrumented Surgery for Thoracolumbar Burst Fractures

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ABSTRACT

Objectives: To study the prevalence and the risk factors for surgical site infection in patients who underwent posterior instrumented surgery for thoracolumbar burst fractures. ***Methodology:*** Retrospective review of cases operated between year 2006 and 2007. The final end point is the detection of surgical site infection within one year. ***Results:*** A total of 38 cases were reviewed. Surgical site infection occurred in 5 cases. Only one had deep infection. The onset of infection occurred within one month in all cases. The risk factors studied were smoking, timing of surgery, duration of surgery, neurological deficit, associated injuries and high dose methylprednisolone administration. None of them were statistically significant as risk factors for surgical site infection. ***Conclusion:*** The prevalence of surgical site infection in patients who underwent posterior instrumented surgery for thoracolumbar burst fractures was 13%.

Key Words:
Surgical Site Infection, Thoracolumbar Burst Fracture, Posterior Instrumentation

INTRODUCTION

Surgical site infection is a common complication following spinal surgery that is associated with high morbidity, mortality and increased health care cost in terms of prolonged hospitalization, long-term antibiotic therapy and reoperation. In the subgroup of spinal surgery patients, surgical site infection was found to be higher in trauma cases as compared to elective [1], thoracolumbar level as compared to cervical [1-2], posterior approach as compared to anterior approach [1-3] and instrumented surgery as compared to non-instrumented surgery [3].

Our study focused on the population including all of these high risk characteristics i.e., trauma patients underwent posterior approach instrumented spine surgery for the thoracolumbar burst fractures. We evaluated the prevalence of and the risk factors for surgical site infection in this high risk group of patients.

MATERIALS AND METHODS

We retrospectively reviewed the medical records of patients who underwent posterior instrumented surgery for thoracolumbar burst fractures in one hospital from 1st January 2006 to 31st December 2007. Inclusion criteria were those cases with acute thoracolumbar burst fractures surgically stabilized with posterior instrumentation using 8 pedicle screws (2 levels above and 2 levels below the fractured vertebra). We excluded those with old injuries, cases treated conservatively with a body cast, those with fracture levels other than between T11 and L2 and elderly patients with osteoporotic fractures.

All patients were given intravenous ceftriaxone 1 gram at induction and underwent surgery via standard posterior approach to the thoracolumbar spine. Pedicle screws were inserted at two levels above and below the fracture site and connected with rods on each side. Posterior decompression (laminectomy) was performed only in cases with spinal compromise and with neurological deficit. Posterolateral autologous bone grafting was performed and a drain was inserted in all cases.

Subject data collected included demographic profile, mechanism of injury, potential risk factors and identification of surgical site infection. Risk factors studied include smoking, neurological status, associated injuries, high dose methylprednisolone administration upon admission, timing of surgery and duration of surgery. A majority of patients were in the productive age group with no co-morbidities; thus age and co-morbidity factors were not analyzed.

The final end point was the detection of surgical site infection within one year period of follow-up following surgery. Identification of surgical site infection was based on the documentation of clinical and/or radiological signs of infection, diagnosis of infection, antibiotic treatment and/or procedure of wound debridement. The infection was considered deep if it extended beyond the deep fascia as assessed intra-operatively during the wound debridement procedure.

The data were analyzed using the SPSS software version 11.5. The chi-square test was used to compare groups of risk

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Table I: Presence of Risk Factors

Risk Factors	Cases With Risk Factors	Cases Without Risk Factors
Smoking	18	20
Neurological Deficit	18	20
Associated Injuries	13	25
High-dose Methylprednisolone Administration	11	27

Table II: Smoking as a Risk Factor

Smoking Status	Surgical Site Infection		Total
	No Infection	Presence of Infection	
Smoker	15	3	18
Non-Smoker	18	2	20

Table III: Neurological Deficit as a Risk Factor

Neurological Status	Surgical Site Infection		Total
	No Infection	Presence of Infection	
Presence of Neurological Deficit	16	2	18
Neurologically Intact	17	3	20

Table IV: Associated Injury as a Risk Factor

Associated Injury	Surgical Site Infection		Total
	No Infection	Presence of Infection	
Present	11	2	13
Absent	22	3	25

factors when nominal data were involved, namely the smoking status, neurological status, associated injury and administration of high dose steroids. The t-test for independent samples was used to compare data on a discrete or continuous scale--namely the timing of surgery and duration of surgery. A p value of < 0.05 was considered significant.

RESULTS

A total of 48 cases met the inclusion criteria. Out of those, 10 cases were excluded due to incomplete notes, having been lost to follow-up, or further follow-up carried out at different hospitals. Therefore, a total of 38 cases were left for analysis. Thirty-two out of the 38 patients (85%) were younger than 50 years of age and 34 patients (90%) were males. Malays predominated totalling 53% of the studied patients. Two-thirds (25 out of 38 patients) of the mechanisms of injury were falls from height while the remaining one-third involved traumas suffered in road-traffic accidents.

Out of the 38 cases, 18 patients were smokers, 18 patients had neurological deficit, 13 patients had associated injuries and 11 patients had been given high dose steroid administration upon admission (Table I). The timing of surgery following initial trauma ranged between 2 days and 24 days and the duration of surgery ranged between 2 and 5 hours.

Surgical site infection occurred in 5 cases (prevalence of 13%). Only one had deep infection (deep infection prevalence of 2.6%) while the rest were superficial infections. The onset of infection was within one month in all cases. All were treated with antibiotics and wound dressing. Three patients had surgical debridement done. All infections were resolved at the latest follow-up within one year.

Three out of 18 smokers (16.7%) had surgical site infection as compared to 2 out of 20 (10%) in the non-smoker group (Table II). When neurological status is analysed, 2 out of 18 (11.1%) of those patients with neurological deficit had surgical site infection as compared to 3 out of 20 (15%) in the group of patients without neurological deficit (Table III). With regard to associated injury, 2 out of 13 (15.4%) patients with associated injury developed surgical site infection whereas in those without associated injury 3 of 25 patients (12%) developed infection (Table IV). For high dose steroid administration, those who got the treatment had a 9.1% infection rate (one out of 11) while 4 out of 27 (14.8%) of those who had not received the treatment developed an infection (Table V). When all of these differences were analyzed using the chi-square test, none were statistically significant.

The mean timing of surgery for the infected group was longer than the non-infected group (11.40 days for infected group as compared to 8.12 days in the non-infected group). The mean duration of surgery for those who developed surgical site infection was also longer (3.7 hours) as compared to those without infection (3.1 hours). However when these differences were analysed with the independent samples t-test, they were not significant.

DISCUSSION

Surgical site infection following spinal surgery is not uncommon [2]. The prevalence reported in the literature depends on many factors; amongst these factors are the methods of identifying the surgical site infection and the study population [2]. Diagnosis of surgical site infection is often not straightforward. Therefore, studies have utilized different criteria to diagnose this problem. The diagnosis is commonly based on wound complications such as pain, inflammation and wound discharge. Specific clinical signs, laboratory and radiographic findings may assist the diagnosis. Included in the definition of surgical site infection by Centers for Disease Control and Prevention (CDC) is any physician diagnosis of surgical site infection [4]. We used some of these parameters to detect surgical site infection in our patients.

Different study populations also had different risk factors depending on the reason for the operation, the site, the approach and the use of instrumentation. Therefore, high prevalence of surgical site infection in one study is not directly comparable to other study with low rate. Overall reported rates of surgical site infection ranged from 0% to 15% [2].

Our study population, a high risk group, had many potential risks to develop surgical site infection,namely acute trauma, instrumented spinal surgery, use of a posterior approach and the pathology located at the thoracolumbar region. These factors have been proven to increase the risk of surgical site infection [1-3]. It is therefore not surprising that our surgical site infection rate was rather high (13%). The relatively high rate of surgical site infection in acute trauma population was clearly shown by Blam *et al.* They found that the acute traumatic spinal injury infection rate was 9.4%, significantly higher than those for elective spinal operations (3.7%) [1]. However if we considered only the deep infection, then the surgical site infection rate in our study was as low as 2.6%.

Included as potential risk factors in our samples were smoking, neurological status, associated injuries, high dose methylprednisolone administration upon admission, timing of surgery and duration of surgery. These factors have also been studied as the potential risks for developing surgical site infection by other authors [1,5-8]. None of the risk factors mentioned prove to be statistically significant as a cause to develop surgical site infection in our study population.

There are other factors that have been shown to have significant risk for surgical site infection: an ASA score greater than 2 [5], obesity [2,5-7], diabetes [2], an increased postoperative intensive care unit stay [1], increased age [1] and medical comorbidities [1]. However , these factors were not examined in our study because 85% of our patients were young (below 50 years old) and most of them had no co-morbidity. We did not have adequate documentation in our medical record to study obesity as a risk factor.

Blam *et al* found that delay to operation was an independently significant risk factor for surgical site infection. In their study surgical treatment beginning more than 160 hours (6.7 days) after the injury carried a risk of postoperative wound infection more than eight times the risk of cases in which treatment began within 48 hours of injury [1]. Wimmer *et al* demonstrated a statistically higher rate of infection with operations lasting longer than 3 hours [8] while Pull ter Gunne and Cohen showed the same risk for those operated longer than 5 hours [7].

Neurological status, associated injuries and high dose methylprednisolone administration on admission did not show obvious influence to increase the risk of surgical site infection in other studies [1-2] Other factors found not associated with increased risk of surgical site infection were gender, race, Glascow Coma Score, preoperative albumin level and duration of hospital stay [1-2].

Knowing the potential risks of developing surgical site infection is very crucial as preventable measures can be undertaken when risks are identified. This is especially so in high risk groups like our study population. Measures like prompt surgery subsequent to medical stabilization and surgery done by an experienced surgeon who's able to avoid prolonged operative times could help to reduce surgical site infection rates.

Limitations of our study included the small number of cases studied and the retrospective nature of the study.

CONCLUSION

The prevalence of surgical site infection in patients who underwent posterior instrumented surgery for thoracolumbar burst fracture was 13%. Most of them were superficial infections; there was only one case of deep infection (2.6%). We were not able to associate the infection with potential risk factors with this study.

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