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Local Administration of Corticosteroids Following Lumbar Spine Surgery Increases Risk of Surgical Site Infection

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Abstract

Background: Patients with lumbar spine surgery experience moderate to severe postoperative leg and back pain. Local administration of a long-acting corticosteroid, methylprednisolone acetate, has been shown to reduce pain after lumbar surgery. However, previous studies in arthroscopic surgery show that intra-articular injections of corticosteroids, may increase the risk of surgical infection. Here we report a 3-year retrospective case control study of the effect of locally applied methylprednisolone acetate following lumbar discectomy on the rate of postoperative infection.

Objective: To evaluate the relationship of methylprednisolone acetate locally applied to the affected nerve roots during lumbar discectomy and the development of post-operative infection.

Methods: We conducted a retrospective review of 5,924 patients who underwent elective lumbar laminectomy and spinal fusion surgery at our institution between 2005 and 2007 for surgical site infection (SSI). 55 patients (0.93%) were diagnosed with SSI who underwent lumbar laminectomy and spine fusion surgery and were matched with a control population of 148 patients without surgical site infection. There were 26 laminectomy SSI in 2791 cases (0.93%) and 29 spine fusion SSI in 3133 cases (0.92%). A case control study was designed to evaluate usage rates for intraoperative epidural methylprednisolone as the primary variable of interest. Additional potential risk factors for SSI were assessed, including the use of IV dexamethasone and locally applied methylprednisolone acetate in the surgical incision. Rates of infection were compared across a series of variables that included systemic steroid use, surgeon, preoperative antibiotic prophylaxis use, procedure type, OR room volume and pre-morbid risk factors and potential patient risk factors such as age, obesity and diabetes. Two-sided p-values were calculated using t-tests for continuous variables and Fisher's exact test for categorical variables. Multivariate logistic regression was used to determine the effect of significant variables identified by univariate analysis on infection rate., by computing an odds ratio and 95% confidence interval.

Results: 25% of participants who developed an infection received methylprednisolone (p=.03) as compared to 13% who were not infected. The factors associated with an increased risk of infection were methylprednisolone odds ratio (OR 6.7, 95%CI: 1.8-25.8), posterior spinal fusion with 1 level implant (OR 5.9, 95%CI: 1.2-28.9), laminectomy decompression (OR 5.8, 95%CI: 1.5-22.8) and obesity OR 29.1, 95%CI: 7.6-111.1). The factors associated with a reduced rate of infection were if the procedure were a revision (OR 0.04, 95%CI: 0.003-0.485) and if the OR room volume was high (OR 0.23, 95%CI: 0.07-0.78). In FY 2007 there were 12 of 892 (1.3%) laminectomy surgical site infections. On September 27, 2007, spine surgeons were recommended to stop the use of locally administered steroids. During FY08 there were only 4 of 868 (0.46%) laminectomy infections after the discontinuation.

Conclusions: While methylprednisolone acetate is used to reduce pain and enhance recovery after lumbar spine surgery, it increases the risk of infection substantially and it should be used with caution in obese and diabetic patients.

Introduction:

A number of pharmacologic strategies have been utilized to attempt to reduce the severity of postoperative pain following lumbar discectomy. These include the preoperative administration of oral nonsteroidal anti-inflammatory medication, intraoperative intravenous dexamethasone, and local administration of corticosteroid directly onto the exposed lumbar nerve root.[1-4] High dose intravenous dexamethasone has been shown to reduce the severity of early postoperative radicular pain following lumbar discectomy.[3] Similarly, a combination of peridural methylprednisolone and wound infiltration with bupivacaine has been shown to reduce postoperative morphine use and pain scores following posterior lumbar spine surgery.[4] Corticosteroid usage has well-known immunosuppressive effects. Although intraarticular injection of methylprednisolone during arthroscopic knee surgery was previously in widespread use as an adjunctive pain control measure, multiple reports of an increased risk of postoperative septic arthritis has raised concern about its ongoing use.[5-7]

Purpose:

Although the possibility of a similar infection risk has been raised in the past in association with epidural steroid use during lumbar spine surgery, available data is limited and conflicting.[8,9] The purpose of this study was to analyze the experience in our high-volume spine surgical center with respect to use of intraoperative epidural methylprednisolone and risk of surgical site infection (SSI).

Methods

We conducted a retrospective review of 5,924 patients who underwent elective lumbar laminectomy and spinal fusion surgery at our institution between 2005 and 2007 for surgical site infection (SSI). 55 patients (0.93%) were diagnosed with SSI who underwent lumbar laminectomy and spine fusion surgery and were matched by age with a control population of 148 patients without surgical site infection. There were 26 laminectomy SSI in 2791 cases (0.93%) and 29 spine fusion SSI in 3133 cases (0.92%). A case control study was designed to evaluate usage rates for intraoperative epidural methylprednisolone as the primary variable of interest. Additional potential risk factors for SSI were assessed, including the use of IV dexamethasone and locally applied methylprednisolone acetate in the surgical incision. Rates of infection were compared across a series of variables that included systemic steroid use, surgeon, preoperative antibiotic prophylaxis use, procedure type, OR room volume and pre-morbid risk factors and potential patient risk factors such as age, obesity and diabetes. Two-sided p-values were calculated using t-tests for continuous variables and Fisher's exact test for categorical variables. Multivariate logistic regression was used to determine the effect of significant variables identified by univariate analysis on infection rate., by computing an odds ratio and 95% confidence interval.

Results

The study sample consisted of 203 patients of whom 55 had an infection documented. The mean age of the study participants was 55 years; this was similar in those with infection compared to those who did not develop an infection (table 1).

Table 1
Patient Demographics

	Whole Sample (n=203)	Patients with Infection (n=55)	Patients without Infection (n=148)
Mean Age (range)	55.12(22-86)	56.84(24-82)	54.48(22-86)
Gender: % female	108 (53.2%)	23 (41.8%)	85(57.4%)

25% of participants who developed an infection received methylprednisolone (p=.03) as compared to 13% who were not infected. The factors associated with an increased risk of infection were methylprednisolone odds ratio (OR 6.7, 95%CI: 1.8-25.8), posterior spinal fusion with 1 level implant (OR 5.9, 95%CI: 1.2-28.9), laminectomy decompression (OR 5.8, 95%CI: 1.5-22.8) and obesity OR 29.1, 95%CI: 7.6-111.1). The factors associated with a reduced rate of infection were if the procedure were a revision (OR 0.04, 95%CI: 0.003-0.485) and if the OR room volume was high (OR 0.23, 95%CI: 0.07-0.78).

Table 2
Comparison of x and y using Multivariate Logistic Regression

		Infection		P-value
		Yes (N=55)	No (N=148)	
Methylprednisolone	Yes	14(25.5%)	19(12.8%)	0.0304
	No	41(74.5%)	128(87.2%)	
Dexamethasone (decadron)	Yes	31(56.4%)	117(79.0%)	0.0012
	No	24(43.6%)	31(21.0%)	
Gender	Female	23(41.8%)	85(57.4%)	0.0475
	Male	32(58.2%)	63(42.6%)	
Type of Procedure				
Laminectomy Decompression		21(38.2%)	16(10.8%)	0.0002
Microdiscectomy		6(10.9%)	36(24.3%)	
Other spine surgery		8(14.6%)	37(25.0%)	
Spine cervical fusion		3(5.5%)	24(16.2%)	
Posterior spine fusion		7(12.7%)	14(9.5%)	
Posterior spine fusion with implant (1 Level)		8(14.6%)	16(10.8%)	
Posterior spine fusion with implant (2 Levels)		2(3.6%)	5(3.4%)	
Obesity	Yes	25(45.4%)	4(2.7%)	<0.0001
	No	30(54.6%)	144(97.3%)	
Diabetes	Yes	11(20.0%)	13(8.8%)	0.0278
	No	44(80.0%)	135(91.2%)	
Bone Morphogenic Protein (BMP)				
	Yes	6(10.9%)	23(15.5%)	0.4020
	No	49(89.1%)	125(84.5%)	
Prophylactic Antibiotic				
Cefazolin		45(81.8%)	113(76.4%)	0.6986
Clindamycin		6(10.9%)	20(13.5%)	
Other (Vanco)		4(7.3%)	15(10.1%)	

Table 3
Surgical variables for patients with an infection versus patients with no infection

		Odds Ratio (OR)	95% Confidence Interval
Depomedrol	Yes vs. No	6.729	(1.753, 25.822)
Pos spinal infusion W/ implant (1 Level)	vs. Other	5.907	(1.220, 28.595
Laminectomy Decompression	vs. Other	5.772	(1.462, 22.781)
Obesity	Yes vs. No	29.096	(7.622, 111.063)
Revision	Yes vs. No	0.036	(0.003, 0.485)
Operative room	>10 vs. ≤10	0.231	(0.069, 0.777)

Discussion

Consistent with prior studies we have demonstrated a higher risk of infection in both diabetic and obese patients undergoing spinal surgery. Until recently a large proportion of patients at our hospital received locally applied methylprednisolone acetate in the surgical incision. This analysis demonstrates that this practice was associated with a 7 fold risk of infection. While methylprednisolone acetate may be used to reduce pain and enhance recovery after lumbar spine surgery, it appears to increase the risk of infection in patients who are diabetic and obese and it should be used with caution.

Addendum

In FY 2007 there were 12 surgical infections in 892 laminectomy spine surgeries with an infection rate of 1.3%. The Infection Control Committee and Section Chair of Spine Service recommended that the routine use of locally administered steroids be stopped. Notices were sent to all spine surgeons reporting the suspicion that this could be increasing the surgical site infection rate in laminectomies. During FY08 there were 4 surgical infections of 868 laminectomy spine surgeries (0.46%) after the discontinuation. In FY09, there have been no surgical site infections out of 248 lumbar laminectomy surgeries.

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