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# Recurrence of Deep Surgical Site Infection in Cerebral Palsy After Spinal Fusion Is Rare

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## Abstract

**Study Design:** Retrospective review of prospective registry.
**Objectives:** To assess the following in children with cerebral palsy (CP) who develop deep surgical site infection (DSSI) after spinal fusion: (1) rate of infection recurrence after treatment; (2) treatments used; (3) radiographic outcomes; and (4) differences in Caregiver Priorities and Child Health Index of Life with Disabilities (CPCHILD) scores versus those of children with no infection (NI).
**Summary of Background Data:** Studies show high rates of surgical site infection in patients with CP but do not address late recurrence or quality-of-life effects.
**Methods:** One hundred fifty-one children with CP underwent spinal fusion surgery from 2008 through 2011 and had ⩾2-year follow-up. Patients who developed DSSI were compared with patients with NI. Student *t* tests were used to analyze deformity; analysis of variance was used to analyze CPCHILD scores in both groups preoperatively and at final follow-up.
**Results:** Eleven patients developed DSSI. Causative organisms were polymicrobial infection (5 cases), *Escherichia coli* (2 cases), and *Proteus mirabilis*, *Staphylococcus aureus*, *Enterococcus faecalis*, and *Peptostreptococcus* (1 case each). All patients underwent irrigation and debridement and received at least 6 weeks of antibiotics. Six had negative-pressure-dressing-assisted wound closure; 5 had primary closure. At mean 4-year follow-up (range, 3–5 years) no patient had recurrent infection. From immediate postoperative to final follow-up, no patient had significant loss of coronal curve ($p = .77$) or pelvic obliquity ($p = .71$) correction. However, at final follow-up, comfort and

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emotions, overall quality-of-life, and total CPCHILD scores in the DSSI group were significantly lower compared with the NI group ($p = .005$, .022, and .026, respectively).

**Conclusions:** In children with CP who developed DSSI after spinal fusion, there was no recurrence of infection or deformity after infection treatment. CPCHILD scores in patients with DSSI were lower compared with the NI group.



*Level of Evidence:* Level II

*Keywords:* Cerebral palsy; Deep surgical site infection; Health-related quality of life; Recurrence; Spinal fusion

## Introduction

Deep surgical site infection (DSSI) after spinal fusion surgery for deformity correction is a major setback, especially in patients with cerebral palsy (CP), who typically have limited physiologic reserve [1,2]. Studies have shown high rates of DSSI in these children [3-6]. Such infections often require repeated debridement and long hospitalization [1,5,7,8]. Factors such as older age, larger curve size, presence of a gastrotomy/gastrojejunostomy tube, higher preoperative white cell count, and longer operative time have been shown to be risk factors for infection [3].

Numerous studies have shown that DSSI after spinal fusion surgery significantly affects the outcome of the surgery, with implications such as recurrence of infection, higher pain scores, and loss of correction of deformity [1,7-12]. Quality-of-life scores in patients who experience DSSI are also lower compared with those of patients with no infection (NI) [9-12]. To the authors' knowledge, the effect of DSSI on health-related quality of life in children with CP has not been quantified. We hypothesized that CP patients would be at risk for recurrence after treatment of DSSI because of their limited physiologic reserve. Our primary objectives were to assess the following in children with CP who develop DSSI after spinal fusion: (1) rate of infection recurrence after treatment; (2) infection treatment strategies; (3) radiographic outcomes; and (4) differences in Caregiver Priorities and Child Health Index of Life with Disabilities (CPCHILD) [13] scores in the DSSI group versus in the NI group.

## Methods

A retrospective review was performed using a prospectively collected, multicenter database of patients with CP who underwent spinal fusion surgery for deformity correction from June 2008 through December 2011. Patients who developed DSSI after surgery and who had a minimum of 2-year follow-up after occurrence of infection were the primary study population. Mean follow-up for this group was 4.3 years (range, 3–5 years). We also included CP patients who were treated with spinal fusion during this same period but did not develop an infection (comparison group).

Eleven patients were identified as having developed DSSI (Table 1). The mean age of the patients (7 boys, 4 girls) was 14 years (range, 9–19 years). Ten patients had a Gross Motor Function Classification System score of 4 or 5, and 1 patient had a score of 2 [14]. Causative organisms were polymicrobial infection (5 cases), *Escherichia coli* (2 cases), and *Proteus mirabilis*, *Staphylococcus aureus*,

Table 1
Radiographic measurements and infection characteristics for pediatric patients with cerebral palsy who developed deep surgical site infection after spinal fusion surgery.

| Patient | GMFCS level | Radiographic measurements | | | | | | Infection characteristics | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Coronal curve, ° | | | Pelvic obliquity, ° | | | Days until infection presented | Negative-pressure dressing | Causative organism |
| | | Preoperative | Immediate postoperative | Last follow-up | Preoperative | Immediate postoperative | Last follow-up | | | |
| 1 | 4 | 62 | 11 | 8 | 38 | 4 | 2 | 14 | Yes | *Escherichia coli* |
| 2 | 4 | 71 | 20 | 23 | 18 | 2 | 2 | 42 | No | *E. coli* |
| 3 | 2 | 91 | 24 | 21 | 35 | 14 | 12 | 3 | Yes | *Proteus mirabilis* |
| 4 | 5 | 144 | 51 | 54 | 21 | 7 | 9 | 84 | No | *P. mirabilis*, *E. coli* |
| 5 | 4 | 136 | 32 | 44 | 25 | 7 | 5 | 230 | No | *Peptostreptococcus* |
| 6 | 4 | 124 | 16 | 12 | 8 | 10 | 10 | 8 | No | *E. coli*, *Staphylococcus aureus* |
| 7 | 5 | 116 | 35 | 40 | 36 | 5 | 2 | 31 | Yes | *Methicillin-sensitive S. aureus* |
| 8 | 5 | 135 | 63 | 68 | 35 | 20 | 19 | 36 | Yes | *Enterococcus faecalis* |
| 9 | 5 | 90 | 68 | 70 | 29 | 21 | 22 | 18 | Yes | Polymicrobial |
| 10 | 5 | 109 | 71 | 69 | 42 | 40 | 45 | 5 | Yes | *Bacteroides fragilis*, *Pseudomonas aeruginosa* |
| 11 | 5 | 120 | 44 | 47 | 61 | 22 | 25 | 28 | No | *S. aureus*, *P. aeruginosa* |

GMFCS, Gross Motor Function Classification System.