



Plastic Multilayered Closure in Pediatric Nonidiopathic Scoliosis Is Associated With a Lower Than Expected Incidence of Wound Complications and Surgical Site Infections

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Abstract

Objective: To compare the incidence of surgical site infection (SSI) and wound complications between standard and plastic multilayered closure (PMC) in patients with pediatric nonidiopathic scoliosis undergoing primary or revision instrumentation or fusion.

Study Design: Retrospective cohort study.

Summary of Background Data: Although PMC has been used for adult spine patients as well as infected spinal wound closure, it has not been reported as routine closure in the pediatric nonidiopathic scoliosis population.

Methods: Patients with nonidiopathic scoliosis undergoing primary or revision instrumentation or fusion between 2013 and 2016 were enrolled. Clinical charts and operative reports were reviewed. Following September 2015, all patients with nonidiopathic scoliosis received PMC closure by plastic or orthopedic surgery. The SSI and wound complication incidence in patients undergoing PMC was compared to standard closure. The mean Risk Severity Score (RSS) for SSI, which uses patient characteristics to calculate the expected SSI probability, was compared to the observed (actual) incidence. The CDC definition of SSI (infection ≤ 90 days of surgery) was used.

Results: 115 patients were identified, including 56 standard closure and 59 PMC (mean age of 10.6 years; 54.8% female; mean preoperative major curve = 57.5°). There was no significant difference in age, sex, race, preoperative major curve, BMI, hemoglobin, blood loss, mean RSS score, or etiology between both groups ($p > .05$). Following PMC implementation, the observed incidence of wound complications decreased significantly from 19.6% in standard closures to 5.1% in the PMC group ($p = .02$), and the SSI incidence decreased from 8.9% to 1.7% ($p = .11$). The overall change in the observed (actual) incidence versus expected (RSS score) incidence of SSI indicated a 7.1% reduction following PMC.

Conclusion: Utilizing PMC in patients undergoing spinal surgery for nonidiopathic scoliosis significantly decreases the incidence of wound complications. Surgeons should consider using PMC in patients with nonidiopathic scoliosis.

Level of Evidence: Level II.

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Introduction

The incidence of surgical site infections (SSIs) following posterior spinal instrumentation and fusion in

patients with nonidiopathic scoliosis varies widely depending on the underlying etiology, ranging from 4.3% to 32% [1-15]. SSI leads to prolonged hospital admission, intravenous antibiotics, multiple returns to the operating room [3,16,17], and a heavy economic burden on the family and health care system [17-19].

Historically, consultation from plastic surgery has been reserved for high-risk patients or those who present with an active infection [20]. However, literature in the adult spine population has shown the efficacy of plastic multilayered closure (PMC) as a pre-emptive technique to reduce the incidence of SSI [21,22]. PMC allows for tension-free

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closure of the deep muscles, which helps to eliminate peri-instrumentation dead space. Ward et al. published a study assessing wound complications in pediatric patients with syndromic or neuromuscular scoliosis undergoing posterior spinal fusion. In this retrospective cohort study, which assessed 42 patients with traditional closure and 34 patients with PMC, they found a significant reduction in the postoperative wound complication incidence from 19% to 0% ($p = .007$) [23].

Since September 2015, our institutional practice has been to use PMC in all patients with pediatric nonidiopathic scoliosis undergoing posterior spinal fusion or instrumentation rather than standard closure. The purpose of this study is to assess the effect of PMC on surgical site infections and wound complications in nonidiopathic scoliosis, including congenital, syndromic, and neuromuscular scoliosis [24]. We hypothesize that PMC is associated with a lower incidence of postoperative wound complications, including SSI and return to the operating room, compared to standard closure.

Materials and Methods

Study design, setting, and participants

A retrospective cohort study design was used. Patients were identified from a single tertiary academic medical center. Pediatric patients with nonidiopathic scoliosis undergoing primary or revision instrumentation or posterior spinal fusion at our institution from January 2013 to

December 2016 were enrolled. According to the system for Classification of Early Onset Scoliosis (C-EOS), this included neuromuscular, congenital, and syndromic etiology [24]. Patients with less than 90 days' follow-up (required for the CDC case definition of SSI) [25], idiopathic etiology, and fusion for acute trauma were excluded.

Data collection

Following IRB approval, all surgical records and operative notes from the orthopedic and plastic surgery service during the 3-year period were reviewed to assess eligibility and ensure consecutive enrollment of all eligible patients. A chart review was also conducted to identify additional variables, including outcomes assessed by surgeons in follow-up outpatient visits.

Intervention

Patients were divided into two groups: standard closure and PMC. The standard closure technique includes conventional fascial, subcutaneous, and skin closure. In contrast, PMC includes the development of myocutaneous flaps and closure of the deep muscles, typically the paraspinous muscles, in a fashion that helps obliterate the peri-instrumentation dead space and relieves tension.

PMC begins with lateral dissection at the level of the muscle fascia and mobilization of the deep muscles as a cohesive muscle flap. The extent of the lateral dissection is often limited by the large perforating vessels from the

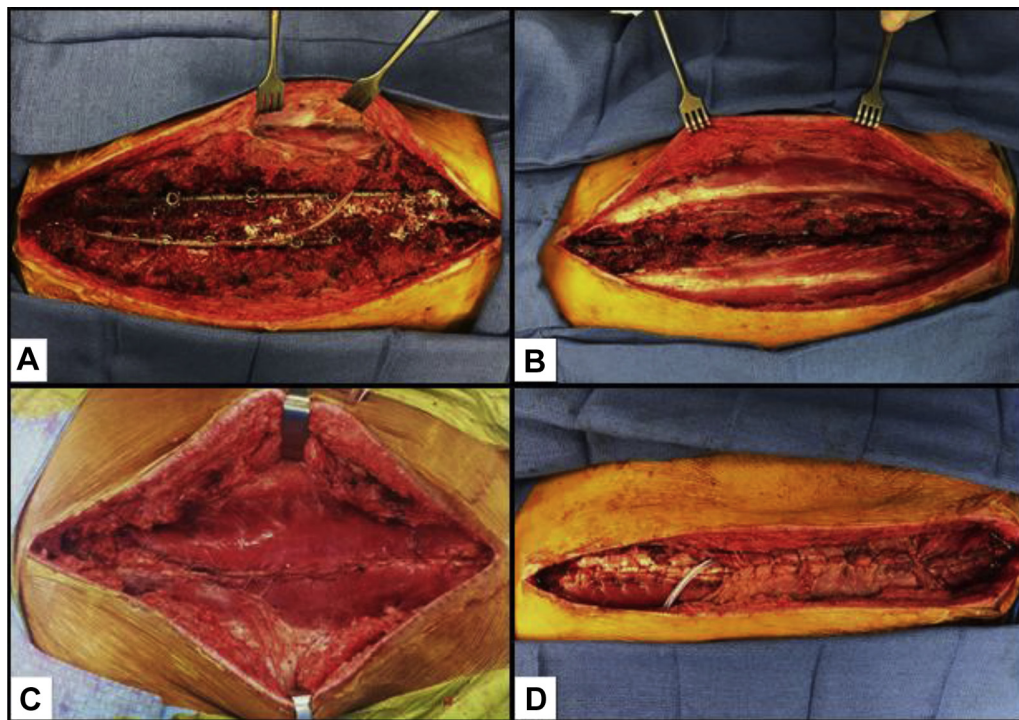


Figure 1. Plastic multilayered closure with the deep muscle flaps developed: (A) Open spine wound with instrumentation; (B) deep muscle flaps developed; (C) closure of the deep muscle layer; (D) closure of the superficial muscle layer.

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