# Multilayer Mattress Stitches for Complicated Wounds in Spine Surgery

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#### Abstract:

**Introduction:** Local infection and prolonged fluid discharge account for most complications in lumbar spine surgery. This report is a brief description of a useful technique for revision of complicated, draining wounds with surprisingly positive results that otherwise frequently require multiple surgical interventions.

**Technical Note:** We describe the postoperative course of three patients, with prolonged and continuous serosanguineous discharge from the skin incision, who underwent wound revision with multilayered mattress stitches after open decompressive or instrumented spinal surgery. For this purpose, a thick monofilament suture is passed through the skin, subcutaneous fatty tissue, and paravertebral muscle in the fashion of a vertical mattress stitch while the loop above the skin level is augmented using a soft silicone capillary drainage to distribute tension along the wound margin.

**Conclusions:** None of the patients treated with the multilayered mattress stitches required further surgical intervention. In this small case series, the multilayered mattress stitches augmented with soft silicone tubing were a useful technique for treating complicated lumbar surgical wounds with prolonged serosanguineous discharge.

## Keywords:

complication, wound, lumbar, spine, mattress, dermatotraction

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#### Introduction

Peri- and postoperative complications occur in approximately 10% of cases in spine surgery<sup>1</sup>). A complicated postoperative course has been associated with particular modifiable and non-modifiable risk factors, including age, gender, body mass index, American Society of Anesthesiologists-Score, and other comorbidities<sup>2-4</sup>). Local infection and prolonged fluid discharge account for most complications in lumbar spine surgery and are associated with various risk factors, among others, diabetes and malnutrition<sup>5.6</sup>). This analysis describes a useful technique for revising complicated, draining wounds after lumbar spine surgery with surprisingly positive results that otherwise frequently require multiple revisions.

## **Technical Note**

Patients with prolonged and continuous serosanguineous discharge from the lumbar skin incision undergoing wound

revision with multilayered mattress stitches after lumbar spinal surgery were the subject of this analysis. After adequate debridement and preparation of the wound bed with tangential excision of wound margins, subcutaneous debulking, and resection of indurated soft tissues, a monofilament suture size 1.0 (Maxon<sup>TM</sup>, Medtronic Minneapolis, MN USA) is used in the fashion of a vertical mattress retention suture, as illustrated by DeFazio et al<sup>7)</sup>. The needle is introduced on one side approximately 4 cm from the wound margin passing through the skin, the subcutaneous fatty tissue as well as the fascia and paravertebral muscle layer before exiting the skin at the same position on the other side of the wound margin. The needle is then reversed and again introduced into the skin approximately 2 cm from the wound margin taking a smaller bite of tissue. The suture loop above the skin level is then augmented using a soft silicone capillary drainage (Medi Drain Soft<sup>®</sup>, Dispomedica GmbH, Hamburg, Germany). Before tensioning the mattress suture, two subfascial, large-caliber suctions drains were placed, and the fascia and subcutaneous tissue are closed in a regular fash-

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**Figure 1.** Schematic illustration of the suture path augmented with a soft silicone tube, traversing through multiple soft tissue layers.

ion. By tensioning the mattress suture, the pressure is exerted through the soft silicone drainage far from the wound, bringing the edges in close approximation and removing tension from the wound edges. After tensioning the mattress sutures, the skin is closed with regular stitches. The mattress sutures are removed seven days postoperatively (Fig. 1, 2).

Three patients (two males, one female) with prolonged serosanguineous discharge from the surgical incision after lumbar spine surgery treated with the above described additional multilayer mattress stitches are described in further detail (Table 1). The multilayer mattress stitches were removed after 7 days in all cases. Even if subjectively considered unlikely by the wound revision time, none of the patients required additional interventions. A postoperative follow-up 4-6 weeks after the index procedure revealed unremarkable wound healing in all cases.

### Discussion

Wound complications account for approximately 20% of early postoperative adverse events in spine surgery<sup>1,5,6)</sup>. Continued discharge from the surgical incision results in a prolonged hospital stay and increased health care costs<sup>3)</sup>. The here described, additional multilayer mattress stitch provides simultaneous closure for both superficial and deep tissue layers resulting in a synergistic effect of reducing dead space and tension-free wound edge approximation by exerting pressure far from the wound margins.

Retraction of the wound edges is caused by loss of tissue after debridement and relaxation of collagen/elastin fibers resulting in increased force required to achieve direct approximation<sup>8</sup>. Dermatotraction, exerted by the placed sutures, uses the skin's viscoelastic properties to induce mechanical creep and stretch the skin by straightening and



**Figure 2.** Intraoperative documentation of the additional multilayer mattress stitch; A: before tensioning of the fascia; B: before subcutaneous suture; C: after tensioning of subcutaneous sutures; D: after skin closure.

elongating collagen fibers along the vector of force<sup>9)</sup>. The force applied to the surrounding tissue by tensioning the suture is redistributed laterally along the wound's length via the soft silicone insert to minimize the risk of suture pull-through and ischemic injury<sup>7)</sup>. Maintaining perfusion and oxygenation to the wound margins by reducing local pressure and avoiding digging-in of the suture loop into the skin is paramount to facilitate wound healing<sup>10)</sup>. Similar techniques have successfully been applied in other fields of surgery, mainly as an adjunct to reduce large wound surface areas in chronic wound therapy<sup>7,11)</sup>. Variations of traction assisted wound closure techniques with and without additional negative pressure wound therapy (NPWT) are well-described

#### Table 1. Case Summary.

	Case 1	Case 2	Case 3
Age (years)	72	77	60
Gender	male	female	male
BMI $(kg/m^2)$	36.42	32.79	27.17
Intervention	Spondylodesis L1-L3, TLIF L2/3	Spondylodesis L2-S2-Ala-Ilium	Decompressive Laminotomy L4/5
Complication Grade <sup>1)</sup>	ISB0	IISB0	ISB0
POD of Revision (days)	9	5	10
Hospital stay (days)	14	46	21
Microbiology	negative	P. mirabilis, E. coli	negative
Risk factors	DM Type II, Obesity Grade II	Chronic kidney failure KDIGO 3b, Obesity Grade I, Malnutrition (NRS 3)	Ischemic heart failure
ASA-Score	III	III	III
Revision case	No	Yes	Yes
Follow-up (weeks)	4	38	6

ASA: American Society of Anesthesiology; BMI: Body Mass Index; KDIGO: Kidney Disease: Improving Global Outcome; NRS: Nutrition Risk Score; TLIF: Transforaminal Lumbar Interbody Fusion

treatment options in complex abdominal wall and limb fasciotomy defects<sup>12-14)</sup>. While multiple reports describe the results of NPWT after lumbar spine surgery, similar reports using dermatotraction with or without NPWT for the closure of complicated lumbar wounds after spine surgery are missing<sup>15-19)</sup>. Potential advantages of dermatotraction include the possibility to change dressings outside the operating room, thereby lowering health care costs and avoiding the necessity for repeated anesthesia.

This report aims to communicate the excellent experience using dermatotraction using multilayered mattress stitches to treat complicated spinal wounds, otherwise frequently requiring multiple surgical interventions. Larger case series with control groups are warranted to determine whether dermatotraction with bridging retention sutures provide an advantage compared to traditional NPWT for complicated wounds in lumbar spine surgery.

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Author Contributions: DB: authored the manuscript, acquired the data

CL: critically revised the manuscript and created the figures and artwork

MF: acquired the cases, critically revised the manuscript, and approved the final version

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