Multiple recurrent postoperative spinal infections due to an unrecognized presacral abscess following placement of bicortical sacral screws: case report

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Postoperative wound infections in spinal surgery remain an important complication to diagnose and treat successfully. In most cases of deep infection, even with instrumentation, aggressive soft-tissue debridement followed by intravenous antibiotics is sufficient. This report presents a patient who underwent L3–S1 laminectomy and pedicle screw placement including bicortical sacral screws. This patient went on to develop multiple (7) recurrent infections at the operative site over a 5-year period. Continued investigation eventually revealed a large presacral abscess, which remained the source of recurrent bacterial seeding via the remaining bone tracts of the bicortical sacral screws placed during the original lumbar surgery. Two years after drainage of this presacral collection via a retroperitoneal approach, the patient remains symptom free.

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KEY WORDS instrumentation; methicillin-resistant *Staphylococcus aureus*; paraspinous and presacral; postoperative infection; spine

SURGICAL site infections (SSIs) are a relatively common complication following spinal surgery, with an incidence of 0.2%–12%, depending on important factors such as open versus minimally invasive procedure and whether spinal instrumentation is used.^{4,14,16} Treatment for deep-seated infections typically consists of an incision and drainage (I & D), removal of devitalized and infected tissues, and wound drains followed by intravenous (IV) antibiotics. In nearly all cases this is sufficient to successfully treat the infection.^{3,6,11,14,18} Even with recurrences it is very rare to require more than 2 I & Ds, and in those resistant cases where secondary osteomyelitis develops, removal of the instrumentation is all that is required to cure the patient in the vast majority of cases.^{3,6,11,14,18} Here we present a case of multiple recurrent infections over a 5-year period after lumbar spinal surgery—despite 6 prior I & Ds and prolonged treatment with broad-spectrum and

then suppressive antibiotics before the patient received the correct diagnosis and definitive treatment requiring both anterior presacral and posterior drainage.

Case Report

A 61-year-old man, a nonsmoker with a medical history of hypertension and asthma, originally presented with intractable low-back pain and leg pain on the right side in an L-4 distribution. Admission CT and MRI scans revealed an L3–S1 spondylosis with multilevel lateral recess stenosis. The patient underwent laminectomies from L-3 to S-1, with bilateral facetectomies and foraminotomies from L-3 to S-1. Pedicle screws were placed bilaterally from L-3 to S-1 with bicortical sacral screws (Fig. 1A). Local bone, supplemented with morselized bone allograft and sponges soaked with recombinant human bone morphogenetic

ABBREVIATIONS I & D = incision and drainage; IV = intravenous; MRSA = methicillin-resistant *Staphylococcus aureus*, SSI = surgical site infection.

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FIG. 1. A: Lateral radiograph depicting lumbar instrumentation obtained shortly after original surgery. The bicortical S-1 screws pass through the anterior surface of the S-1 vertebra (arrow). **B:** Axial CT scan at S-1 level taken 6 months postoperatively. Bicortical location can again be noted as well as a degree of lucency around both pedicle screws (arrows).

FIG. 2. A: Sagittal T2-weighted scan demonstrating extensive collection in paraspinous, superficial, and presacral locations (arrows). This MRI scan was taken just before the combined anterior-posterior debridement performed at our institution, approximately 5 years after the original lumbar surgery. **B:** Axial T2-weighted scan demonstrating the communication of infectious material through the S-1 screw tract on the left (arrows).

protein-2 (Medtronic, Inc.), was implanted posterolaterally along the construct. On the 7th day after his lumbar surgery the patient returned home.

Approximately 1 month later the patient returned to clinic reporting fevers and chills as well as drainage from his lumbar incision. He was admitted for suspected infection, and a Gram stain of aspirated fluid showed gram-positive cocci. The patient underwent I & D of a deep lumbar wound infection. Cultures demonstrated growth of methicillin-resistant *Staphylococcus aureus* (MRSA). The patient was discharged on postoperative Day 5 with an 8-week course of IV vancomycin.

Approximately 9 months after his first I & D, the patient developed a recurrent deep-seated infection, which was managed with a repeat (second) I & D and removal of all hardware (Fig. 1B). A course of IV antibiotics was completed. Despite these interventions the patient went on to require 4 more I & Ds over a 30-month period. These recurrences were treated similarly with I & D and long-term IV antibiotics, followed by 1 year of suppressive therapy with doxycycline.

Five years after the original surgery, the patient presented to our hospital with his seventh SSI. On this occasion MRI and CT scans noted the presence of multiple paraspinous collections posteriorly and laterally on the left. The MRI scan also detected the presence of a presacral collection extending from L-5 to S-5. Evidence of an infection in this presacral and posterior paraspinous location necessitated both anterior and posterolateral approaches to adequately debride the infectious material (Fig. 2). The surgical procedure consisted of the following: 1) a left retroperitoneal approach to drain the presacral abscess, which drained 100 ml of pus under high pressure; and 2) a posterior approach to drain the posterolateral abscess on the left, with drains placed in both locations. Cultures grew MRSA and the patient was then placed on an 8-week course of IV daptomycin and Zosyn. Postoperative MRI scans demonstrated marked reduction in the size of the abscess after 3 months. The patient was restarted on suppressive oral antibiotic therapy (doxycycline), to be contin-

ued indefinitely. The patient has been followed closely for 2 years, and to date the presacral and paraspinous collections remain minimal and the patient has not had recurrent symptoms to suggest infection (Fig. 3).

Discussion

The standard of care in treating SSIs presenting as deep infections after spinal instrumentation consists of I & D followed by IV antibiotics. Early and aggressive handling of the infected soft tissues typically allows the patient to retain the hardware.^{2,3,6,8,14,19} There have been no reports of multiple recurrences from a presacral source.

Surgical site infection represents a significant challenge following lumbar spinal surgery—and in open procedures with a posterior approach in the presence of instrumentation even more so. Postoperative spinal infection rates range from 0.2% to 12%, with posterior instrumented procedures—particularly in the setting of cancer—falling in the higher end of this range.^{3,12,14,16} Surgical spinal procedures and the use of instrumentation are increasing each year, and therefore managing postoperative infections is becoming increasingly important.

Although all lumbar spinal surgeries carry a risk of infection, several factors increase this risk, including the following: posterior surgical approach, open surgical procedure, and the presence of instrumentation.^{3,4,7,8,10,12,14,15,19} Additionally, the presence of instrumentation can make infections more difficult to treat.^{14,15,19} Longer operating times and prolonged retraction associated with the placement of instrumentation probably contribute.^{17,19} Although the literature is not unanimous, several studies cite the benefit of retaining spinal implants in the treatment of acute SSI. Quail states that the aim is to retain implants if possible,¹⁹ and Levi et al. advocate leaving hardware in place whenever feasible, so long as it is securely attached to the spine. In a retrospective study, hardware was maintained in 16 of 17 successfully treated SSIs.¹⁴ Once the SSI becomes chronic, several studies advocate removal of

FIG. 3. Sagittal T2-weighted MRI scan taken at 8 months after combined anterior-posterior debridement demonstrates a significant reduction in the presacral collection (arrow).

instrumentation, because retention is associated with persistent and recurrent infections.^{2,6,9}

Although instrumentation does markedly increase the risk of infection, it is often necessary when the patient's spine requires stabilization.^{1,14,19,20} Bicortical screws are a good example of this: by breaching 2 segments of cortical bone, these screws offer a greater degree of stability than do monocortical screws.^{5,13,21} This is especially important at the lumbosacral junction when a long fusion lever arm is present.¹³ On the other hand, our patient's case shows that as a screw passes through the anterior surface of the vertebrae it opens the potential for reinfection through recurrent seeding of the sacral tract. Similarly, if large-diameter screws are used and bicortical penetration is achieved, one will create a larger lumen for the transfer of material and fluid between the posterior and anterior aspects of the vertebral column. This is most relevant in the setting of infection, and thus must be considered. On retrospective review of imaging that was performed at another hospital approximately 18 months after removal of hardware,

FIG. 4. A 3D reconstruction of the conduit produced by removal of spinal instrumentation. Here we demonstrate the ability of microbes and debris to pass back and forth between the posterior and anterior aspects of the spine. Copyright Roberto Suazo. Published with permission.

the beginning of this patient's presacral collection can be noted. Although subtle, this abnormal presacral enhancement almost certainly progressed into the larger abscess that was eventually drained anteriorly.

Our patient continued to present with recurrent infections despite the treatment protocol, which has been documented in the literature as a means to eradicate SSI. Of the 17 patients described by Levi et al., 15 required just 1 I & D, whereas the other 2 patients required a second I & D. At the 8-month follow-up visit there were no recurrent infections.¹⁴ Of the 21 patients with SSIs described by Chaichana et al., only 1 required 2 washouts to eradicate the infection, whereas all other patients required only 1 washout, and at follow-up no patients had signs of recurrent infection.³ In contrast to what has been reported in the literature, our patient presented with 7 recurrent infections requiring 8 I & Ds and numerous rounds of antibiotics over a 5-year period, including indefinite suppressive therapy. A major factor in the difficulty in treating our patient's recurrent infections was the presence of simultaneous presacral and paraspinal abscesses that communicated via the bicortical sacral screw tracts (Fig. 4).

Conclusions

This patient presented with multiple recurrences of SSI after lumbar spinal instrumentation and required a total of 8 I & Ds over a 5-year period due to an unrecognized presacral abscess following placement of bicortical sacral screws. The importance of this case is to highlight a mech-

anism of seeding to the presacral space after removal of spinal instrumentation, a process not previously described in the literature. Although biomechanical advantages are conferred with the use of bicortical sacral screws, careful surveillance, with attention to the presacral space, should be paid in infections requiring removal of hardware.

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Author Contributions

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