www.surgicalneurologyint.com

Surgical Neurology International

Editor-in-Chief: Nancy E. Epstein, MD, Professor of Clinical Neurosurgery, School of Medicine, State U. of NY at Stony Brook.

SNI: Infection

Editor
Ali Akhaddar, MD, IFAANS
Avicenne Military Hospital, Marrakech, Morocco

ScientificScholar®
Knowledge is power
Publisher of Scientific Journals

SNI
Open Access

Case Report

Intramedullary spinal cord abscess as postoperative complication: A case report

Amber Lynn Valeri[1], Adam Alayli[2], Jonah Gordon[2], Gavin Lockard[2], Nam D. Tran[1]

[1]Department of Neurosurgery, H. Lee Moffitt Cancer Center and Research Institute, [2]Morsani College of Medicine, Tampa, FL, United States.

E-mail: Amber Lynn Valeri - amber.valeri88@gmail.com; Adam Alayli - adamlayli@usf.edu; Jonah Gordon - jonahgordon@usf.edu; Gavin Lockard - gavinlockard@usf.edu; *Nam D Tran - nam.tran@moffitt.org

***Corresponding author:**
Nam D. Tran,
Department of Neurosurgery, H. Lee Moffitt Cancer Center and Research Institute, Tampa, FL, United States.

nam.tran@moffitt.org

Received: 21 February 2023
Accepted: 01 November 2023
Published: 03 May 2024

DOI
10.25259/SNI_176_2023

Quick Response Code:

ABSTRACT

Background: Intramedullary spinal cord abscesses (ISCA) can result in high morbidity and mortality if not treated in a timely manner. The incidence and outcomes of postsurgical ISCA are unknown. We present a case of a 52-year-old male patient with neurofibromatosis type 1 who developed an intramedullary spinal cord abscess after a previous resection of a cervical intradural, extramedullary neurofibroma.

Case Description: A 52-year-old male with a history of neurofibromatosis type 1 had previously undergone multiple resections of cervical intradural, extramedullary neurofibromas with internal stabilization. Sixteen months after his initial surgery, he developed acute-onset interscapular pain with bilateral lower extremity pain and left hemi-body weakness. Magnetic resonance imaging (MRI) of the cervical spine demonstrated an enlarging contrast-enhancing intramedullary lesion. Surgical exploration and evacuation of the lesion were completed. Intramedullary cultures confirmed a *Serratia marcescens* abscess. After abscess evacuation and intravenous antibiotics, the patient's symptoms resolved.

Conclusion: Given the potential for permanent neurologic damage and loss of independence with intramedullary spinal cord abscess, we advocate that clinicians maintain a high index of suspicion in the postsurgical patient. Diagnostic imaging through contrasted MRI or computed tomography myelogram should be obtained, and prompt intervention, including evacuation and/or antibiotics, should be implemented for the best chance of a favorable outcome.

Keywords: Intramedullary spinal cord abscess, Spinal cord abscess, Postoperative complication

INTRODUCTION

First reported in 1830, intramedullary spinal cord abscesses (ISCA) are rare entities previously associated with high morbidity and mortality.[8] Before advances in antibiotics, diagnostic imaging modalities, and early surgical interventions, ISCA carried a mortality rate of nearly 90% that dramatically improved to approximately 4%.[2,11] On the same lines, antibiotics have reduced the most common means of dissemination through hematogenous spread from 50% to about 8%.[4] In 1949, Foley. Proposed multiple mechanisms for its rare occurrence, including the smaller volume of the spinal cord compared to the brain, the small lumen diameter and acute angles of the spinal arteries, and the protective barrier of the dura.[6]

The usual acute clinical presentation of ISCA often includes fever, pain, and neurologic deficit; however, in a chronic setting, fever and pain may be absent.[10] Given the severe consequences of a delayed intervention, a high index of suspicion, early diagnosis, and intervention are prerequisites for optimal outcomes. We report a case of a patient at our institution who developed an ISCA in a delayed fashion after neurosurgical intervention.

CASE REPORT

A 52-year-old male with a history of neurofibromatosis type 1 presented to our institution in 2020 for a second opinion regarding a cervical intramedullary lesion causing severe pain and myelopathy. He initially developed cervical myelopathy with ambulatory dysfunction and loss of fine motor hand dexterity. Magnetic resonance imaging (MRI) of the cervical spine demonstrated a cervical intradural, extramedullary lesion at the level of C2. In March 2017, he underwent an intradural resection of the extramedullary lesion and instrumented fusion with pathology consistent with neurofibroma. Postoperative MRI of the cervical spine demonstrated decompression of the spinal cord without evidence of intramedullary lesion [Figure 1a]. He received adjuvant radiation therapy for the residual cervical tumor.

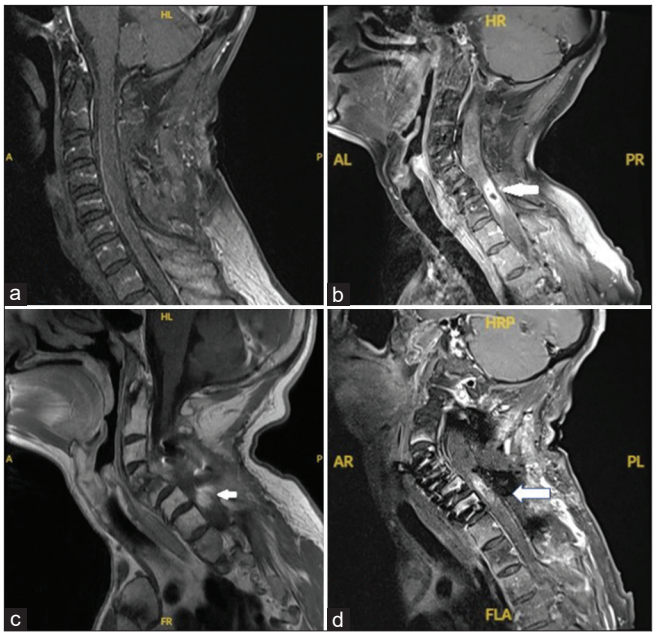

Figure 1: (a) Postoperative sagittal magnetic resonance imaging (MRI) of the cervical spine with contrast showing lack of enhancement in the spinal cord. (b) Follow-up sagittal MRI of the cervical spine with contrast showing enhancement in the spinal cord. (c) Sagittal MRI of the cervical spine with contrast showing enhancement in the spinal cord. (d) Postoperative sagittal MRI of the cervical spine with contrast showing resolution of the intramedullary abscess. Arrows indicate intramedullary enhancement of the spinal cord.

In December 2020, he developed rapidly progressive myelopathy with the inability to walk and frequent falls. MRI of the cervical spine demonstrated the progression of known neurofibromas with spinal cord compression and edema bilaterally from C3 to C6 [Figure 1b]. Fluorodeoxyglucose (FDG)-positron emission tomography scan demonstrated a small focal uptake of FDG within the spinal cord at the level of C5–C6. In February 2021, he underwent resection of the C5–C6 intradural, extramedullary tumor with internal stabilization. Pathology confirmed neurofibroma. His symptoms improved following surgery.

In November 2021, he developed left-sided neck and upper extremity pain, which was associated with bilateral shoulder abduction and left elbow flexion weakness. MRI of the cervical spine demonstrated increased size of the intradural nerve sheath tumor in the dorsal aspect of the canal at C6–C7 with persistent intramedullary enhancement at C6 [Figure 1c]. Differential diagnosis included spinal cord demyelination, ependymoma, meningioma, and infection. Computed tomography (CT) myelogram demonstrated lucency at his left C3 and C6 screws with anterior spondylolisthesis of C3 on C4. He was recommended to have a staged anterior and posterior instrumented fusion. He underwent C3–C7 anterior cervical discectomy and fusion in May 2022. Initially, after surgery, he improved but developed acute, severe intra-scapular pain with radiation into the bilateral lower extremities and left hemi-body weakness after six weeks. MRI of the cervical spine demonstrated an increase in size of an enhancing intramedullary lesion at the level of C6–C7 with worsening edema.

In July 2022, the patient underwent an exploration of the intramedullary lesion at C6–C7. On the sharp opening of the dura, the spinal cord surface showed scarring but no other abnormality. Using intraoperative ultrasound, a midline myelotomy was made directly over the location of the suspected intramedullary lesion. The creamy exudate was appreciated on dissection. Intramedullary cultures were positive for *Serratia marcescens*. MRI of the cervical spine postoperatively demonstrated evacuation of the intramedullary lesion [Figure 1d]. Postoperatively, the patient recovered full strength in his extremities. He was discharged to home with a plan for life-long suppressive antibiotics. The patient provided written consent for personal images to be included in this report.

DISCUSSION

As proposed by Foley (1949), the spinal cord's unique anatomy renders it relatively resistant to infection. The blood-spinal cord barrier is the equivalent of the blood-brain barrier and protects against intradural infections. As such, ISCAs are considered quite rare, with only 141 reported cases since the first documentation by Hart in 1830.[8,10,21] In pediatric

Table 1: Cases of intramedullary spinal cord abscess after neurosurgical intervention.

No.	Age (Y) / Sex	Comorbidities	Previous surgery on neuro axis	Time interval to abscess	Presentation	Imaging	CSF Prior	Organism cultured	Surgical Intervention	Tx plan	Followup imaging results	Outcome	Ref.
1	47 M	Back pain	Multiple "failed back surgeries" not specified; intrathecal pain pump	4 years	Inability to ambulate or move legs	MRI	No	Streptococcus anginosus	Laminectomy + Myelotomy, removal of pumop	IV abx	MRI: Abscess resolution	20-month post op: ASIA D with motor preserced in left leg and 50% key motor groups motor strength 3 or more. Ambulates with assistive device	[20]
2	27 M	obstructive uropathy, chronic renal failure	T11-L1 laminectomy and resection of low grade glioma	3 months	Presentation 1: bladder problem. 2 mos later, presentation 2: fever, rapid worsening motor power of bilateral LE x1 week	MRI	No	E. coli	Laminectomy + Myelotomy	IV abx	NA	Death	[13]
3	45 F	Diabetes	Radical excision of cervical intramedullary pilocytic astrocytoma	Not stated	Fever, neck pain, paresthesia in all limbs, progressive lower extremity weakness, bladder incontinence	MRI	No	None	None	Abx for UTI-related sepsis (2 weeks), oral Cefuroxime	MRI: Abscess resolution	4 weeks post-op: improved spasticity. Continued urinary incontinence and 3-4/5 lower extremity motor strength with dissociated sensory loss	[18]
4	47 F	Chronic histoplasmosis	Temporal brain biopsy positive for histoplasmosis	2 months	Paresis, bladder/ bowel incontinence	MRI	Yes	Histoplasmosis	Laminectomy + Myelotomy	Amphotericin + voriconazole	MRI: Abscess resolution	3/5 bilateral lower extremities, non-ambulatory @ 1 year	[9]
5	26 M	Diabetes	Laminectomy L1-4, incision and biopsy of intradural lipoma at age 10	16 years	Low back pain x2 weeks. Paresthesia to bilateral feet that ascended to groin, weakness to left foot. 24 hrs unable to walk or pass urine	1. CT Myelogram 2. MRI	No	Sterile	Laminectomy + Myelotomy	Chloramphenicol, benzylpenicillin and metronidazole x8 weeks, then continued again x3 months	NA	4 months post-op: normal sphincter control. Ambulated with assistance, 4/5 right HF, 3/5 left DF/PF, 0/5 right DF/PF. Diminished sensation below T10	[7]
6	20 F	Hx of lumbar meningocele closed at birth, 2 years developed pus at scar and meningitis, persistent sinus	Lumbar meningocele	20 years	Low back pain, weakness and numbness of legs/ buttocks, urinary retention	CT Myelogram	No	Anaerobic Streptococci	Laminectomy, intradural exploration and drainage	Parenteral flagyl + flucloxacillin + gentamycin	NA	5 months post-op: independent ambulation, normal sphincter control, moderate right dorsiflexion weakness	[12]
7	4 M	Meningitis after birth, dermal sinus	Removal of dermal sinus	4 years	Headaches, nausea, photophobia	MRI	Yes	E. coli	Laminectomy + Myelotomy	Abx not specified	Abscess recurrence	Normal neurologic function @ 1 year	[14]
8	1.25 F	Dermal sinus tract from birth	Removal of dermal sinus	8 months	Flaccid paraplegia, urinary and bowel incontinence	MRI	Yes	Enterococcus faecalis	Laminectomy + Myelotomy	Cefotaxime, amoxicillin, and vancomycin	NA	Normal neurologic function @ 1 year	[14]
9	52 F	NF 1	Cervical laminectomy, intradural extramedullary neurofibroma resection, stabilization	16 months	Pain, left hemi-body paresis	MRI	Yes	Serratia marcescens	Laminectomy, intradural exploration and drainage	Ciprofloxacin, Bactrim	MRI: Abscess resolution	Normal neurologic function @ 6 months	Presenting case

F: Female, M: Male, NA: Not applicable, HF: Hip flexion, DF: Dorsiflexion, PF: Plantar flexion, CSF: cerebral spinal fluid, Tx: Treatment, MRI: Magnetic resonance imaging, CT: Computed tomography, ASIA: American spinal injury association, NF: Neurofibromatosis

patients, congenital structural abnormalities such as dermal sinus tracts and epidermoid tumors are associated with an increased risk of intradural infections. In contrast, structural lesions in adults such as dermoid cysts, meningomyelocele, spinal cord tumors, and vascular malformations (Dural arteriovenous malformations or fistulas) are also associated. Systemic comorbidities associated with increased incidence of ISCA include immunosuppression, diabetes, intravenous drug use, alcoholism, infective endocarditis, genitourinary infections, pulmonary disease, and trauma.[1,3,5,12,13,16-19]

When first described, ISCA was associated with hematogenous spread from an extraspinal source in 50% of cases, which has since been reduced to about 8% with the invention of antibiotics.[4] Through a review of the literature, seven papers described eight patients who developed ISCA, presumably through direct inoculation following neurosurgical intervention. Postoperative central nervous system infection, such as meningitis, is more frequent and dependent on multiple factors. One such factor contributing to the decreased incidence is the use of prophylactic preoperative antibiotics targeted at the patient's skin flora. Cefazolin is commonly used in neurosurgical procedures, whereas vancomycin is preferred if the patient is colonized with multi-resistant *Staphylococcus aureus* (MRSA) or if MRSA is prevalent in the institution. We cannot determine the prophylactic antibiotics used in these eight cases. Of interest, only 25% of the cases involved skin flora, while 75% of the organisms were gram-negative. Another important contributing factor is the role of adequate water-tight closure of the dura and overlying tissue to prevent local spread. Patients who are on immune suppressants or prolonged steroids following neurosurgical procedures can be predisposed to pyogenic infections. Further, steroids can cause immunosuppression, which can delay or dampen the response to infection (i.e., fever, leukocytosis, etc.). We cannot account for the prolonged average interval (6.4 years) from surgery to the presentation of ISCA described in the literature. We speculate that this may be related to an abscess being essentially walled off from the immune system in the spinal cord and only becoming symptomatic when it reaches a size large enough to cause mass effect and neurologic compromise. A review of cases documented in the literature is described in Table 1.[7,9,14,20]

In our case, the patient developed acute pain and neurologic deficits 16 months after the initial resection of his cervical intramedullary neurofibroma with imaging concerning an enlarging lesion with worsening edema. On surgical exploration through laminectomy and midline myelotomy, purulent drainage was appreciated, and cultures were positive for *S. marcescens*. In general, early diagnosis and urgent intervention followed by long-term antibiotic therapy have improved neurologic prognosis.[4,15] Of the reported postsurgical cases, all patients had MRI or CT myelogram findings consistent with an intramedullary pathology concerning abscess. In only three cases, cerebrospinal fluid was obtained before treatment. All but one case required surgical evacuation of the abscess followed by long-term intravenous antibiotics, while one patient had a resolution of a presumed ISCA with antibiotic therapy alone. Outcome data were reported in all eight cases, including two patients with complete recovery similar to our patient. Three patients were ambulatory within five months of surgery, two patients were nonambulatory, and one patient succumbed to his systemic infection.

CONCLUSION

ISCA is a rare entity, and even more so in the postoperative patient. Initial presentation of ISCA can often be vague but rapidly progresses to neurologic deficit, requiring a thorough history and physical. Given the potential for permanent neurologic damage and loss of independence with intramedullary spinal cord abscess, as clinicians, we need to have a high index of suspicion in the postsurgical patients. We recommend diagnostic imaging, either through MRI with contrast or CT myelogram. However, the previous study is the best choice today, is obtained expediently, and urgent intervention, including evacuation and/or antibiotics, should not be delayed for the best chance of a favorable outcome.

Authors contributions

NDT and ALV: Conceptualized the study. AA, JG, and GL: Conducted the literature review. ALV: Collected the patient data and wrote the manuscript with. NDT: Assisting and supervising. ALV and NDT: Accept full responsibility for the work, had access to the data, and controlled the decision to publish. All authors reviewed the final manuscript. The corresponding author attests that all listed authors meet authorship criteria and that no others meeting the criteria have been omitted.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

Use of artificial intelligence (AI)-assisted technology for manuscript preparation

The authors confirm that there was no use of artificial intelligence (AI)-assisted technology for assisting in the

writing or editing of the manuscript and no images were manipulated using AI.

REFERENCES

1. Arnáiz-García ME, González-Santos JM, López-Rodriguez J, Dalmau-Sorli MJ, Bueno-Codoñer M, Arévalo-Abascal A. Intramedullary cervical abscess in the setting of aortic valve endocarditis. Asian Cardiovasc Thorac Ann 2015;23:64-6.
2. Arzt PK. Abscess within the spinal cord: Review of the literature and report of three cases. Arch Neurol Psychiatry 1944;51:533-43.
3. Babu R, Jafar JJ, Huang PP, Budzilovich GN, Ransohoff J. Intramedullary abscess associated with a spinal cord ependymoma: Case report. Neurosurgery 1992;30:121-3.
4. Chan CT, Gold WL. Intramedullary abscess of the spinal cord in the antibiotic era: Clinical features, microbial etiologies, trends in pathogenesis, and outcomes. Clin Infect Dis 1998;27:619-26.
5. Da Silva PS, de Souza Loduca RD. Intramedullary spinal cord abscess as complication of lumbar puncture: A case-based update. Childs Nerv Syst 2013;29:1061-8.
6. Foley J. Intramedullary abscess of the spinal cord. Lancet 1949;254:193-5.
7. Hardwidge C, Palsingh J, Williams B. Pyomyelia: An intramedullary spinal abscess complicating lumbar lipoma with spina bifida. Br J Neurosurg 1993;7:419-22.
8. Hart J. Case of encysted abscess in the center of the spinal cord. Dublin Hosp Rep 1830;5:522-4.
9. Hott JS, Horn E, Sonntag VK, Coons SW, Shetter A. Intramedullary histoplasmosis spinal cord abscess in a nonendemic region: Case report and review of the literature. J Spinal Disord Tech 2003;16:212-5.
10. Jabbar R, Szmyd B, Jankowski J, Lusa W, Pawelczy A, Wysiadecki G, *et al*. Intramedullary spinal cord abscess with concomitant spinal degenerative disease: A case report and systemic literature review. J Clin Med 2022;11:5148.
11. Kurita N, Sakurai Y, Taniguhi M, Terao T, Takahashi H, Mannen T. Intramedullary spinal cord abscess treated with antibiotic therapy: case report and review. Neurol Med Chir (Tokyo) 2009;49:262-8.
12. Maurice-Williams RS, Pamphilon D, Coakham HB. Intramedullary abscess-- a rare complication of spinal dysraphism. J Neurol Neurosurg Psychiatry 1980;43:1045-8.
13. Mohindra S, Gupta R, Mathuriya SN, Radotra BD. Intramedullary abscess in association with tumor at the conus medullaris. Report of two cases. J Neurosurg Spine 2007;6:350-3.
14. Morandi X, Mercier P, Fournier HD, Brassier G. Dermal sinus and intramedullary spinal cord abscess. Report of two cases and review of the literature. Childs Nerv Syst 1999;15:202-6.
15. Simon JK, Lazareff JA, Diament MJ, Kennedy WA. Intramedullary abscess of the spinal cord in children: A case report and review of the literature. Pediatr Infect Dis J 2003;22:186-92.
16. Sverzut JM, Laval C, Smadja P, Gigaud M, Sevely A, Manelfe C. Spinal cord abscess in a heroin addict: Case report. Neuroradiology 1998;40:455-8.
17. Takebe N, Iwasaki K, Hashikata H, Toda H. Intramedullary spinal cord abscess and subsequent granuloma formation: A rare complication of vertebral osteomyelitis detected by diffusion-weighted magnetic resonance imaging. Neurosurg Focus 2014;37:E12.
18. Thakar S, Rao A, Mohan D, Hegde A. Metachronous occurrence of an intramedullary abscess following radical excision of a cervical intramedullary pilocytic astrocytoma. Neurol India 2013;61:322-4.
19. Ueno T, Nishijima H, Funamizu Y, Kon T, Haga R, Arai A, *et al*. Intramedullary spinal cord abscess associated with spinal dural arteriovenous fistula. J Neurol Sci 2016;368:94-6.
20. Vadera S, Harrop JS, Sharan AD. Intrathecal granuloma and intramedullary abscess associated with an intrathecal morphine pump. Neuromodulation 2007;10:6-11.
21. Vo DT, Cravens GF, Germann RE. *Streptococcus pneumoniae* meningitis complicated by an intramedullary abscess: A case report and review of the literature. J Med Case Rep 2016;10:290.

How to cite this article: Valeri AL, Alayli A, Gordon J, Lockard G, Tran ND. Intramedullary spinal cord abscess as postoperative complication: A case report. Surg Neurol Int. 2024;15:147. doi: 10.25259/SNI_176_2023