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Spinal meningitis and abscess associated with dermal sinus tract: a case report

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ABSTRACT

This case report discusses an 11-month-old male with a dermal sinus tract (DST) complicated by spinal meningitis and a long-segment intramedullary abscess. DSTs are rare congenital malformations that may remain asymptomatic until complicated by infections or neurological deficits. The patient was presented with prolonged fever and motor weakness in the extremities, leading to the discovery of a lumbosacral DST and associated abscess via cerebrospinal fluid (CSF) analysis and contrast-enhanced spinal MRI. Prompt surgical excision of the DST, drainage of the abscess, and prolonged antibiotic therapy resulted in significant clinical improvement. This case underscores the importance of early recognition, advanced imaging, and aggressive management to mitigate the severe neurological consequences of DST-associated infections.

Keywords: Dermal sinus tract, spinal meningitis, magnetic resonance imaging

INTRODUCTION

Dermal sinus tracts (DSTs) are rare congenital malformations that are caused by an incomplete separation of the neural ectoderm from the cutaneous ectoderm during embryogenesis. DSTs are epithelial-lined tracts that may extend between the skin and the spinal cord, cauda equina, or arachnoid.[1,2] While many DSTs are identified in infancy or early childhood due to skin manifestations, they may remain asymptomatic until complicated by infections or neurological deficits.[3]

Infection of the sinus tract can lead to serious complications such as meningitis, epidural-intradural or spinal cord abscess. These infections are a major cause of morbidity and hospitalization in the pediatric population.[4] Intramedullary spinal cord abscess is an extremely rare infection of the central nervous system, with fewer than 150 cases reported in the literature. These lesions most typically arise in the thoracic and lumbar spine in individuals with congenital midline defects or anatomical abnormalities.[5,6] Early diagnosis and rapid treatment are crucial to prevent potential neurological sequelae and mortality.[7]

In this case report, we aimed to present the clinical features and magnetic resonance imaging (MRI) findings of a pediatric case with DST and accompanying long segment spinal cord abscess.

CASE

The 11-month-old previously healthy male, born full-term via normal vaginal delivery with up-to-date vaccinations, presented to our clinic with a one-month history of daily fever peaking at 39°C, resolving with antipyretics. No associated symptoms were present. He had been hospitalized for 15 days at a tertiary hospital and treated with broad-spectrum antibiotics, followed by 3 days at another center with ampicillin-sulbactam. Blood and urine culture tests were negative. Immunological and infectious tests were negative for cytomegalovirus, Ebstein-Barr virus, and Brucella.

The patient was admitted to our clinic for further evaluation of prolonged fever. Blood and urine infection tests performed in our center were also negative. Abdominal ultrasonography and echocardiography were normal. Peripheral blood smear and bone marrow examination revealed no signs of leukemia or malignancy. Physical examination revealed significant loss of motor strength in both bilateral upper extremities (2/5) and lower extremities (1/5). Additionally, a midline located sacral dimple was noted. Other systemic examinations were unremarkable. Subsequently, the patient developed persistent fever, tachycardia, and further weakness in the upper extremities. Laboratory tests revealed an elevated

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white blood cell count (14.000 cells/μL), increased C-reactive protein level (16 mg/dl) and anemia (Hb: 6.8 g/dl). Septicemia was suspected, and empiric meropenem antibiotherapy was promptly initiated.

Lumbar puncture performed to analyze cerebrospinal fluid (CSF). Additionaly contrast-enhanced spinal MRI was scheduled. CSF analysis indicated glucose levels of 0.94 mg/dl, protein levels of 1.57 g/L and a white blood cell count of 8560 mm^3 (90% neutrophils). CSF bacterial culture results showed a polymicrobial appearance, including gram-positive diplococci, gram-negative bacilli, and anaerobic organisms. On T2W and STIR MR images, there was a diffuse hyperintense signal consistent with myelitis throughout the entire spinal cord from the medulla oblongata to the level of the conus medullaris (**Figure 1a, b**). Sagittal contrast-enhanced T1W image showed leptomeningeal enhancement and peripherally enhancing interconnected fluid collections at the T7-S2 level (**Figure 1c**). These findings were consistent with spinal meningitis complicated by intramedullary abscess. Contrast-enhanced spinal MRI also revealed a possible appearance of a DST is noted posterior to the S1-2 vertebral level.

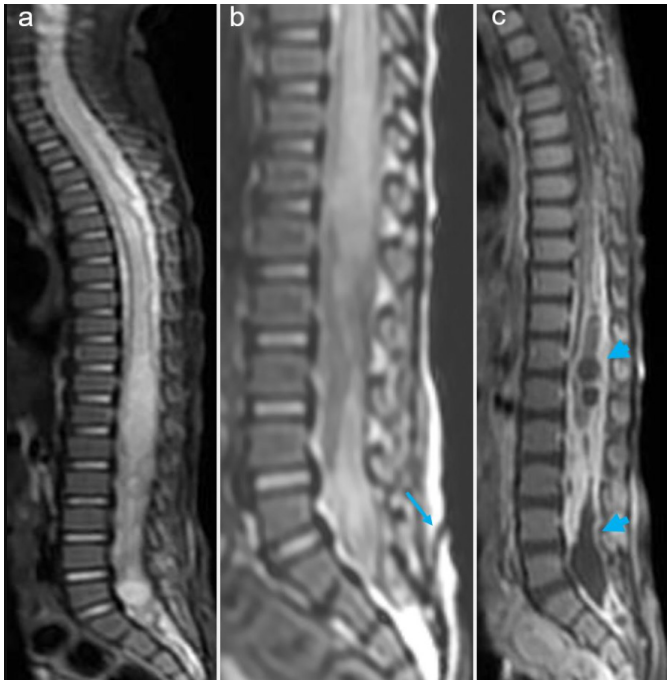

Figure 1. a, b. Sagittal T2-weighted and short tau inversion recovery (STIR) images show a diffuse signal increase and expansion in the spinal cord, consistent with myelitis. The sagittal T2-weighted image also demonstrates dermal sinus tract (long arrow) at the S1-S2 level. **c.** Sagittal contrast-enhanced T1-weighted image demonstrates interconnected fluid collections with rim enhancement within the spinal cord (arrowheads) and thick enhancement on dura between T7-S2 levels. This appearance is consistent with spinal meningitis and abscess.

The patient underwent surgery to remove the DST and drain the intramedullary abscess. Fistula tract was evident in the subcutaneous tissue entering the dural sac. There was a white, soft-consistency tumor tissue containing hair, resembling a dermoid tumor, in the intradural area at the L5-S1 vertebra level. The pathological diagnosis of this lesion was ruptured dermoid cyst. Following the surgery, the patient was monitored in the ward under broad-spectrum antibiotic therapy for three months and subsequently discharged. Follow-up contrast-enhanced spinal MRI revealed regression in the size and enhancement of the described collection and soft tissue areas.

DISCUSSION

DSTs are congenital malformations present at birth over the dorsal midline where an aberrant epithelialized connection from the skin tracks inwards towards the spine.[8] They are one of the types of spinal dysraphism and are observed in 1 in 2500 live births.[9,10] DSTs are predominantly located in the lumbosacral region. A 1990 review of all reported cases of congenital spinal DSTs indicated that 1% of the tracts were located in the cervical region, 10% in the thoracic region, 41% in the lumbar region, and 35% in the lumbosacral region. About 50% of DSTs are associated with inclusion tumors (epidermoid, dermoid, or teratoma) along their path and 83% of the accompanying tumors are dermoid cysts.[11] The DST in our case, like most cases in the literature, was located in the lumbosacral region, and a dermoid cyst accompanying this malformation was identified during surgery.

The most common clinical presentation of DSTs is a small dimple or sinus opening located in the midline of the skin. These skin findings may be accompanied by findings such as hyperpigmentation, hypertrichosis, and angiomata. Unlike coccygeal pits, which are frequently observed in the midline of newborns, these findings may be associated with occult spinal dysraphism and therefore require imaging of the spinal neuraxis.[1,8] About 30% of DST cases exhibit neurological deficits, such as lower limb weakness, sensory disturbances, altered reflexes, changes in bowel or bladder function, or gait abnormalities.[1,2] Since the tract terminates in the intradural space or around the spinal elements in approximately 80% of DSTs, a potential pathway for pediatric spinal infections is created. Infectious complications of DSTs such as abscess and meningitis were observed in half of the cases in some older studies.[11] However, they have been rarely reported in the modern era due to the increased awareness of primary care physicians regarding DST and early diagnosis with MRI.[1,3,12]

Spinal intramedullary abscess secondary to DST is a very rare but life-threatening condition with only 50 cases reported to date. Fever, lower extremity weakness and urinary disturbances are the most common presentations.[7,13,14] These lesions have been reported more frequently in children under 3 years of age. *Staphylococcus aureus* is the most commonly isolated microorganism, and multiple bacteria are grown in culture in one out of five cases of secondary spinal abscess to the DST.[13,15] In our case, similar to the literature, spinal abscess secondary to DST was detected in early childhood. In addition, the polymicrobial appearance in the bacterial culture of the case is striking.

MRI is the primary diagnostic tool for the diagnosis of both DSTs and complications such as meningitis and abscesses that develop secondary to these lesions. MRI can clearly reveal the location of the sinus tract and the termination area (dura, spinal cord) and provide detailed information about neural structures thanks to its excellent soft tissue resolution.[16] In addition, lesions such as inclusion cysts (dermoid, epidermoid), split cord malformation, and filum terminale lipoma that may accompany DSTs can be easily depicted on spinal MRI.[13,16] Spinal intramedullary abscesses are heterogeneously hypointense on T1W images and hyperintense on T2W images and show peripheral enhancement.[13] Spinal abscesses often spread along a long segment, as in our case, and rarely,

involvement of the entire spinal cord can be observed.[13,17] When the abscess is in the dural space and the cord covers a large area, the accompanying inclusion cysts may not be selected on MRI, as in our case.

The main treatment approach for intramedullary abscesses secondary to DST is excision of the sinus tract and drainage of the abscess. In addition, long-term postoperative antibiotic therapy is necessary to prevent the recurrence of residual infection.[13,15] Early diagnosis and prompt treatment are crucial to prevent permanent neurological deficit and potential morbidity and mortality.[15] The case we presented and the outcome of the cases in literature with prompt treatment highlight this view.

CONCLUSION

In conclusion, this case report highlights the critical importance of early recognition and management of DST-associated complications, including spinal meningitis and intramedullary abscesses. Prompt diagnosis using advanced imaging modalities and timely surgical and antibiotic interventions can significantly mitigate morbidity and prevent long-term neurological sequelae in such rare congenital malformations.

ETHICAL DECLARATIONS

Informed Consent

The patient signed and free and informed consent form.

Referee Evaluation Process

Externally peer-reviewed.

Conflict of Interest Statement

The authors have no conflicts of interest to declare.

Financial Disclosure

The authors declared that this study has received no financial support.

Author Contributions

All of the authors declare that they have all participated in the design, execution, and analysis of the paper, and that they have approved the final version.

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