Intramedullary spinal teratomas are rare. We report a case in a 40-year-old male who presented with progressive weakness over the right side of the body and gait imbalance. He had dermal sinus with hair patch over the nape of the neck. Magnetic resonance imaging revealed cervical (C4–C7) intramedullary tumor with dermal sinus tract. C3–C7 laminectomy was performed and tumor excised along with the sinus tract. Histopathological examination revealed mature cystic teratoma. Gait ataxia was improved immediately while near complete recovery in motor power was achieved over a period of 2–3 weeks.

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At the end, very thinned out, pulsatile cord parenchyma observed along with horizontally traversing cervical nerve roots very much close to the margin of the inner cyst wall. Histopathological examination of the cyst wall/sinus tract showed skin with adnexal structure, respiratory epithelium, cartilage muscle adipose tissue, cerebral tissues as well as psammoma bodies. As the tumor included elements of all the three germinal layers and did not show cytological evidence of malignancy, the final diagnosis of a benign mature cystic teratoma was made. Postoperatively, gait ataxia improved immediately while near complete recovery in motor power achieved over a period of 2–3 weeks.

**Discussion**

Teratomas are uncommon spinal tumors. The usual locations are extradural and intradural extramedullary. However, intramedullary spinal teratomas are rare in adults. The thoracolumbar region of the spinal cord is the most commonly affected site in adults. Only eight cases of cervical intramedullary teratoma have been reported (Table 1), each with an absence of any congenital dermal sinus. Amongst them, one was extensive, extending from the medulla to the L2 level. Ak et al. reported a lesion in the upper cervical cord at the C2–3 level and in the other two cases, the lesions were located in the lower cervical segments at the levels of C6–T1. In the available literature, we found a single case of cervical teratoma with congenital dermal sinus with an extramedullary location in which a complete excision of the lesion was possible. Several hypotheses have been proposed for the origin of spinal cord teratomas. The most widely accepted theory is a misplacement of pluripotent embryonic cells into the dorsal midline during their normal migration from the primitive yolk sac to the gonadal ridges.

The typical location of most central nervous system teratomas in midline structures supports the theory that they originate from pluripotent cell rests at the sites of early neural tube closure. In addition, there is a well-known association of spinal cord teratomas with dysraphic congenital spinal malformations such as spina bifida, dermal sinus, split cord, meningomyelocele, lipomeningomyelocele, syringomis, and thickened terminal

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**Figure 1:** (a) Magnetic resonance imaging of cervical spine T2-weighted sagittal view showing a 2.5 cm × 1.5 cm × 2 cm intramedullary mass lesion extending from C4 and C7 level and a dermal sinus tract extending from the skin surface to the lesion at the level of C5 vertebrae. (b) Magnetic resonance imaging of cervical spine T1-weighted sagittal view showing a contrast nonenhancing mass with a contrast-enhancing dermal sinus. (c) Magnetic resonance imaging of cervical spine T2 weighted axial view showing an intramedullary mass. (d) Magnetic resonance imaging of cervical spine post contrast axial view showing an intramedullary mass.

**Figure 2:** Hematoxylin-eosin-stained section showing typical histological appearances. (a) Cartilage (b) epidermis with eccrine glands (c) hair follicle with adipose tissue (d) sebaceous glands.
This association suggests that a developmental fault arose during embryogenesis related to dysfunction of several factors that probably involve genetic and cellular inductive interaction. There may be a cause-and-effect relationship between spinal cord malformation and the migration of pluripotent cells that get entrapped in an abnormal environment and lead to teratoma formation.

One of the associations, dermal sinus tracts, is an uncommon form of spinal dysraphism often presenting in childhood with skin findings, neurologic deficit, or infection and results from dysfunction during fetal development. Normally, between the 3rd to 8th week of gestation, the ectoderm that gives rise to the skin and dermal appendages separates from the neuroectoderm that gives rise to the spinal cord. This process, referred to as disjunction, allows for the insertion of mesoderm, which then forms the vertebral column and underlying musculature that separates the skin from the spinal cord. When a focal failure of disjunction occurs, a persistent connection, or tract, between the skin elements and the underlying neural structures is established. This tract is lined by stratified squamous epithelium encased in dermal tissue and terminates on or near neural structures.

Table 1: Details of the eight published cases of adult cervical intramedullary teratoma

| Authors and year | Age (years), sex | Location | Accompanying abnormalities | Neuropathy | Histology | Resection | Adjuvant therapy | Follow-Up |
|------------------|------------------|----------|-----------------------------|------------|-----------|-----------|-----------------|-----------|
| Dereymaeker, 1954 | 43, male         | C5-T2    | Bifid T2-3, nonunion of C-1  | Myelopathy | Teratoma   | Subtotal  | No              | No comment |
| Padovani et al., 1982 | 21, female      | C6-T1    | Not obvious on plain roentgenogram | Progressive radiculopathy and myelopathy | Teratoma | Subtotal | No              | Neurologically unmodified until 4 years |
| Paterakis et al., 2006 | 63, male        | C2-5     | Vertebral body fusion C3-5, nonunion of C-1 | Progressive radiculopathy and myelopathy | Mature | Subtotal | No              | Died 3 months later due to respiratory failure unrelated to teratoma |
| Ak et al., 2006 | 43, female       | C2-4     | Midline nodular soft skin mass connecting into dura at C-3 level | Progressive radiculopathy and myelopathy | Mature | Total | No              | No comment |
| Makary et al., 2007 | 46, female      | C1-2     | Bifid C-2, vertebral body fusion C2-3, scoliosis C3-4, dermal sinus connecting into dura | Progressive radiculopathy and myelopathy | Mature | Total | No              | 6 months after operation, no neurological evidence of recurrence; no follow-up MRI |
| Arvin et al., 2009 | 34, male        | C4-6     | Bifid C-6                    | Progressive radiculopathy | Mature | Total | No              | No evidence of recurrence on 2-year follow-up MRI |
| Moon et al. | 35, male         | C6-T1    | Absence                      | Progressive myelopathy | Immature | Near total | No              | Rapid and huge recurrence lesion on serial follow-up MRI until 8 months after surgery |
| Our case | 40, male         | C4-C7    | Dermal sinus tract, C3 and C4 spina bifida | Progressive myelopathy | Mature | Near total | No              | Gait ataxia improved and the patient achieved near complete recovery in motor power over a period of 2-3 weeks. Clinical evidence of recurrence at 4 months of follow-up |

MRI: Magnetic resonance imaging

filum.[11] This association suggests that a developmental fault arose during embryogenesis related to dysfunction of several factors that probably involve genetic and cellular inductive interaction.[7] There may be a cause-and-effect relationship between spinal cord malformation and the migration of pluripotent cells that get entrapped in an abnormal environment and lead to teratoma formation.
There are no specific clinical or radiological features for the preoperative diagnosis of these lesions. However, several authors have reported clinical features including weakness of the leg, sensory changes, reflex abnormalities, and urinary incontinence which are related to the location of the tumors.[10] The operative findings revealed that the degree of spinal cord compression by the mass was severe. However, the patient’s neurological symptoms were not severe presumably because of the slow-growing nature. The plain radiography would show bony erosion and widening of the interpedicular space with or without vertebral abnormalities at the level of the lesion. Vertebral abnormalities include spina bifida, vertebral body fusion, asymmetry of the vertebral bodies, and diastematomyelia.[12] Computed tomography scanning may show variable tumor density or calcification. MRI usually shows mixed high and low signal intensity corresponding to cystic and solid composition of the tumor.[12] Calcification within the tumor, although not detected on imaging studies, can be present at the microscopic level in the lesion.[2]

The distinction between enterogenous cysts and mature teratomas of the spinal cord is a histopathological and clinical dilemma, in the presence of a coexisting occult neural tube dysraphism. Enterogenous cysts are subdivided into three groups: Group I is characterized histologically by the presence of only endodermal derived tissues; Group II by endodermal- and mesodermal-derived tissues; and Group III by endo-, meso-, and ectodermal-derived tissue components.[1] In our patient, the presence of tridermal-derived tissues makes the lesion distinct from Groups I and II. In addition, the features favoring teratoma over Group III ECs were the dorsal location of the tumor and the absence of the ventrally located dysraphic features associated with EC (including cysts of the mediastinum, duplication of the gastrointestinal tract, malformations of the vertebral bodies, or a defect in the vertebral column that communicates with the abdomen or thorax). Furthermore, in our patient, the bone defect (spina bifida) was present at the level of the tumor. In contrast, in patients with enterogenous cysts, the associated bone defect is usually several segments caudal to the lesion, as embryological vertebral bodies move caudally relative to the spinal cord.

Total resection is the treatment of choice for mature teratomas, whenever there is a good plane of cleavage between the tumor tissue and the cord parenchyma. However, marked tumor adhesions to the adjacent neural tissues, as in our case, preclude attempt at complete resection due to neural tissue injury and surgery should be aimed at maximum safe possible removal of the lesion. Such a procedure would hopefully provide patients with many symptom-free years due to the generally extremely slow growth of the residual teratomatous tissue. Outcome in terms of the clinical recovery varies. The role of adjuvant therapy of spinal cord teratoma is not well characterized because of the rarity of these lesions and the limited collective experience in their management.

Early clinical detection of cutaneous markers as well as widespread availability of the neuroimaging of the asymptomatic patients would help in the diagnosis of these rare congenital lesions before the neurological deficit sets in.

**Declaration of patient consent**

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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**Conflicts of interest**

There are no conflicts of interest.

**REFERENCES**

1. Fernández-Cornejo VJ, Martínez-Pérez M, Polo-García LA, Martínez-Lage JF, Poza M. Cystic mature teratoma of the filum terminale in an adult. Case report and review of the literature. Neurocirugia (Astur) 2004;15:290-3.

2. Nonomura Y, Miyamoto K, Wada E, Hosoe H, Nishimoto H, Ogura H, et al. Intramedullary teratoma of the spine: Report of two adult cases. Spinal Cord 2002;40:40-3.

3. Dereymaeker A. Medullary compression by congenital tumors or cysts. Acta Neurol Psychiatr Belg 1954;54:874-89.

4. Padovani R, Tognetti F, Sanpaolo P, Pozzati E, Gaist G, Kuba I. Intramedullary cystic teratoma. Acta Neurochir (Wien) 1982;62:101-8.

5. Paterakis KN, Karantanas AH, Barbanis S, Hadjigeorgiou GM, Karavelis A. Cervical spinal cord intramedullary teratoma. Clin Neurol Neurosurg 2006;108:514-7.

6. Ak H, Ulu MO, Sar M, Albayram S, Aydin S, Uzun M, et al. Adult intramedullary mature teratoma of the spinal cord: Review of the literature illustrated with an unusual example. Acta Neurochir (Wien) 2006;148:663-9.

7. Makary R, Wolfson D, Dasilva V, Mohammadi A, Shuja S. Intramedullary mature teratoma of the cervical spinal cord at C1-2 associated with occult spinal dysraphism in an adult. Case report and review of the literature. J Neurosurg Spine 2007;6:579-84.

8. Arvin B, Pohl U, David K. Intramedullary cervical teratoma in an adult. Spine J 2009;9:e14-8.

9. Moon HJ, Shin BK, Kim JH, Kim JH, Kwon TH, Chung HS,
et al. Adult cervical intramedullary teratoma: First reported immature case. J Neurosurg Spine 2010;13:283-7.

10. Ustii M, Erdogan A. Cervical spinal teratoma associated with dermal sinus tract: MRI and surgical findings. Turk Neurosurg 1992;2:194-8.

11. Muthukumar N. Split cord malformation and cystic teratoma masquerading as lipomeningomyelocele. Childs Nerv Syst 2003;19:46-9.

12. Ugarte N, Gonzalez-Crussi F, Sotelo-Avila C. Diastomatomyelia associated with teratomas. Report of two cases. J Neurosurg 1980;53:720-5.