

Figure 1. Magnetic resonance imaging (MRI) of the cervical spine showed an intraspinal mass continuing to the C3 nerve root, with high intensity on T2-weighted imaging (A) and iso-intensity on T1-weighted imaging (B). The mass was enhanced by gadolinium-diethylenetriaminepentaacetic acid (C, D).



Figure 2. An intraoperative view of the tumor mass continuing to the C3 nerve root (A). The tumor was surgically excised (B).

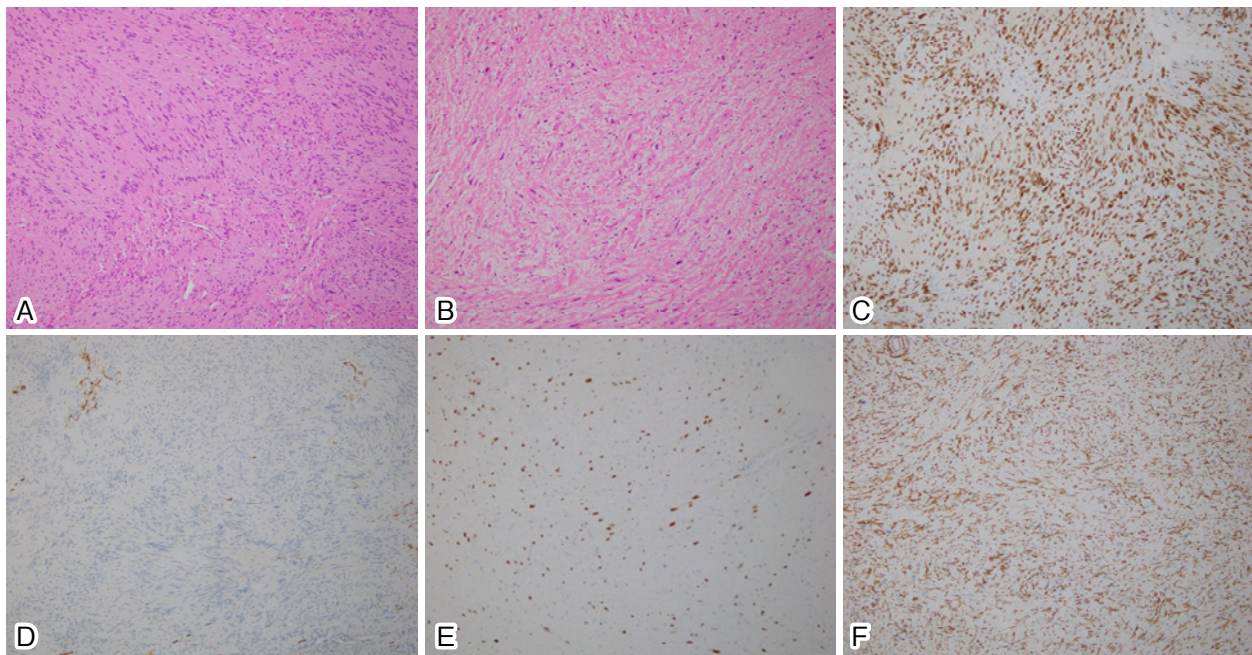


Figure 3. Spindle cells are arranged in short bundles with nuclear palisading. HE $\times 100$ (A). Small spindle-shaped cells are loosely arranged with collagen fibers (B). Immunohistochemical findings. The Schwann cells expressed SOX10 (C). The tumor cells in the schwannomatous component were CD34-negative (D). The spindle cells in the neurofibromatous component were partially SOX10-positive (E). Stromal cells were CD34-positive (F).

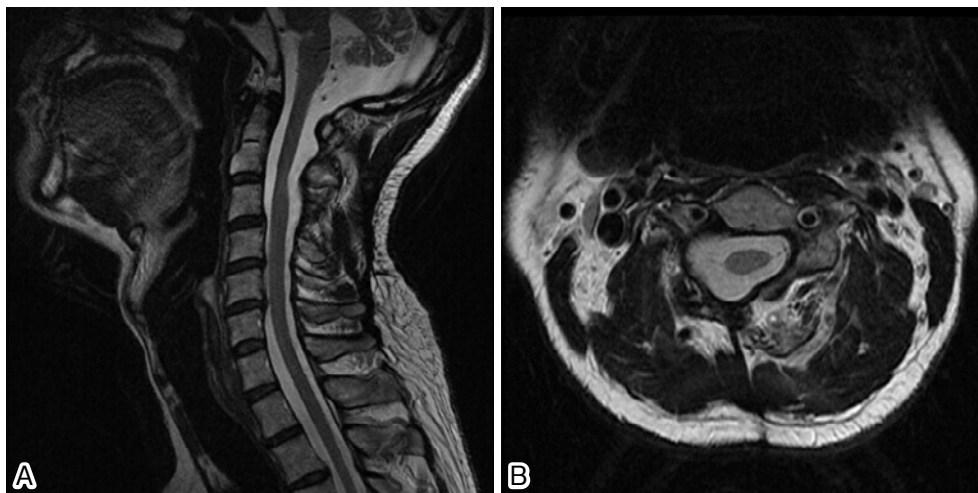


Figure 4. MRI of the cervical spine performed two years after surgery showed no recurrence.

HPNST has been described in detail, in which two schwannoma-perineurioma tumors, suggesting HTS, originated from the posterior nerve root in the thoracic level and the cauda equina in the lumbar level, respectively. In contrast in the present case, the patient required reoperation due to local recurrence at only five months after initial surgery of tumor resection¹⁰. In our case, we did not observe recurrence of the tumor at the final follow-up (two years after surgery). Although further studies are needed to clarify the risk factors for malignancy in spinal HPNST, the histological subtype of HPNST, presence of HTS, and level at which the tumor develops may be associated with the risk of malignancy.

Conflicts of Interest: The authors declare that there are no relevant conflicts of interest.

Author Contributions: KI designed and executed the experiments and wrote the manuscript. YI was a major contributor in writing the manuscript. HK contributed in introducing the concept of pathology. ET, TM, SI, YK, YT, AH, and SI contributed in introducing the concept of orthopedic surgery and helped write the manuscript. HC is a supervisor and edited the manuscript. All authors reviewed and approved the final manuscript.

Informed Consent: Informed consent was obtained from

this patient in this study.

References

1. Hornick JL, Michal M. Hybrid nerve sheath tumors. In: Fletcher CDM, Bridge JA, Hogendoorn PCW, Mertens F, editors. WHO Classification of Tumors of Soft Tissue and Bone. 4th ed. IARC: Lyon; 2013.
2. Antonescu CR, Stemmer-Rachamimov AO, Perry A. Hybrid nerve sheath tumors. In: Louis DN, Ohgaki H, Wiestler OD, Caveneo WK, Ellison DW, et al., editors. WHO Classification of Tumors of the Central Nervous System Revised. 4th ed. IARC: Lyon; 2016. p. 224-5.
3. Ud Din N, Ahmad Z, Abdul-Ghafar J, et al. Hybrid peripheral nerve sheath tumors: report of five cases and detailed review of literature. *BMC Cancer*. 2017;17(1):349. doi: 10.1186/s12885-017-3350-1.
4. National Institutes of Health Consensus Development Conference Statement: Neurofibromatosis Arch Neurol Chicago. 1988;45:p. 575-578.
5. Baser ME, Friedman JM, Wallace AJ, et al. Evaluation of clinical diagnostic criteria for neurofibromatosis 2. *Neurology*. 2002;59(11):1759-65; doi: 10.1212/01.WNL.0000035638.74084.F4
6. Plotkin SR, Blakeley JO, Evans DG, et al. Update from the 2011 International Schwannomatosis Workshop: From genetics to diagnostic criteria. *Am J Med Genet A*. 2013;161A(3):405-16. Published online 2013 Feb 7. doi:10.1002/ajmg.a.35760.
7. Michal M, Kazakov DV, Michal M. Hybrid peripheral nerve sheath tumors: A review. *Cesk Patol*. 2017;53(2):81-8.
8. Kuroda N, Kazakov DV, Hes O. Hybrid peripheral nerve sheath tumor of the nasal cavity showing schwannomatous, neurofibromatous, and perineuriomatous areas. *Med Mol Morphol*. 2010;43(2): 82-5. doi:10.1007/s00795-008-0418-7.
9. Chow LT. Primary intraosseous hybrid nerve sheath tumor of femur: a hitherto undescribed occurrence in bone with secondary aneurysmal bone cyst formation resulting in pathological fracture. *Pathol Res Pract*. 2015;211(5):409-14. doi: 10.1016/j.prp.2014.10.014.
10. Hayashi T, Hirose T, Nishimura Y, et al. Hybrid schwannoma/perineurioma of the spinal nerve: multifocal occurrence, and recurrence as an intraneural perineurioma. *Pathol Int*. 2013;63(7):368-73. doi:10.1111/pin.12073.

Spine Surgery and Related Research is an Open Access journal distributed under the Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International License. To view the details of this license, please visit (<https://creativecommons.org/licenses/by-nc-nd/4.0/>).