Surgical Neurology International

OPEN ACCESS

For entire Editorial Board visit : http://www.surgicalneurologyint.com

Editor-in-Chief: **James I. Ausman,** MD, PhD University of California, Los Angeles, CA, USA

Case Report

# Navigation-guided endoscopic biopsy for pathological diagnosis for intraparenchymal pure germinoma near the ventricular trigone

Kuniyuki Onuma[1], Eiichi Ishikawa[1], Masahide Matsuda[1], Yasushi Shibata[1,2], Kaishi Satomi[3], Tetsuya Yamamoto[1], Alexander Zaboronok[1], Shingo Takano[1], Akira Matsumura[1]

Departments of [1]Neurosurgery and [3]Diagnostic Pathology, Graduate School of Comprehensive Human Sciences, University of Tsukuba, Tsukuba, Ibaraki 305-8575, [2]Department of Neurosurgery, Mito Kyodo General Hospital, Mito, Ibaraki 310-0015, Japan

E-mail: Kuniyuki Onuma - kuniyuki11@hotmail.com; *Eiichi Ishikawa - e-ishikawa@md.tsukuba.ac.jp; Masahide Matsuda - m-matsuda@md.tsukuba.ac.jp; Yasushi Shibata - yshibata@md.tsukuba.ac.jp; Kaishi Satomi - c0830393@md.tsukuba.ac.jp; Tetsuya Yamamoto - yamamoto_neurosurg@md.tsukuba.ac.jp; Alexander Zaboronok - als.neuro@gmail.com; Shingo Takano - shingo4@md.tsukuba.ac.jp; Akira Matsumura - a-matsumur@md.tsukuba.ac.jp
*Corresponding author

Received: 21 November 11 Accepted: 29 December 11 Published: 21 January 12

**This article may be cited as:**
Onuma K, Ishikawa E, Matsuda M, Shibata Y, Satomi K, Yamamoto T, *et al.* Navigation-guided endoscopic biopsy for pathological diagnosis for intraparenchymal pure germinoma near the ventricular trigone. Surg Neurol Int 2012;3:9.

Available FREE in open access from: http://www.surgicalneurologyint.com/text.asp?2012/3/1/9/92177



## Abstract

**Background:** The authors report a case of intraparenchymal germinoma pathologically diagnosed using navigation-guided endoscopic biopsy.

**Case Description:** A 27-year-old man had mild left hemiparesis, transcortical motor aphasia, and amnesia. Magnetic resonance (MR) imaging revealed an intraparenchymal mass lesion near the left ventricular trigone. Navigation-guided endoscopic biopsy was performed, and histopathology revealed large neoplastic cells immunohistochemically positive for germinoma-specific antigens, which were diagnosed as pure germinoma. Chemotherapy with whole-brain radiotherapy was performed, and the neurological symptoms did not change during the treatment. Follow-up MR imaging 1 year after the surgery showed no evidence of recurrence or dissemination.

**Conclusions:** Navigation-guided endoscopic biopsy can be a useful technique in such intraparenchymal germinoma cases.

**Key Words:** Biopsy, brain tumor, endoscopy, germ cell tumor, navigation

**Access this article online**

**Website:** www.surgicalneurologyint.com

**DOI:** 10.4103/2152-7806.92177

**Quick Response Code:**

## INTRODUCTION

Germ cell tumors (GCTs) are rare neoplasms of the central nervous system (CNS);[7] their incidence is 2.8% or less in all primary brain tumors.[8,16,18] Germinoma is the most frequent pathological type accounting for over two-thirds of CNS GCTs. GCTs are commonly located in the pineal region and/or the neurohypophysis,[3,6,15,21] but are rarely found in the basal ganglia (BG),[17,22] the cerebellopontine angle, the lateral ventricle, the cerebellum, or the corpus callosum.[8,12] In very rare cases, they also appear in the brainstem,[13] the cranial nerves,[1] or in the spinal cord.[9] Pathological diagnosis by biopsy is essential for GCTs located in these uncommon regions, if there are no tumor markers detected. However, a small amount of tissue in biopsy samples often results in a misdiagnosis, such as a granulomatous lesion or other type of GCTs.[5,10]

Here, we report a case of intraparenchymal germinoma near the left ventricular trigone, pathologically diagnosed using navigation-guided endoscopic biopsy.

## CASE REPORT

A 27-year-old man was introduced to our hospital with a

1-year history of gait disturbance. On admission, he had mild left hemiparesis, transcortical motor aphasia, and amnesia, with 80% of Karnofsky Index of Performance Status (KPS). Magnetic resonance (MR) imaging revealed an intraparenchymal mass lesion near the left ventricular trigone [Figure 1]. Computed tomography (CT) revealed a slightly high density mass with punctuate calcification. The serum levels of beta-human chorionic gonadotropin (β-HCG) and alpha-fetoprotein (α-FP) were within normal range. Cytology of the cerebrospinal fluid did not reveal any abnormalities. In the preoperative differential diagnosis, germinoma was highly suspected rather than high-grade glioma or malignant lymphoma, as there were atrophic changes in the left thalamus near the lesion.

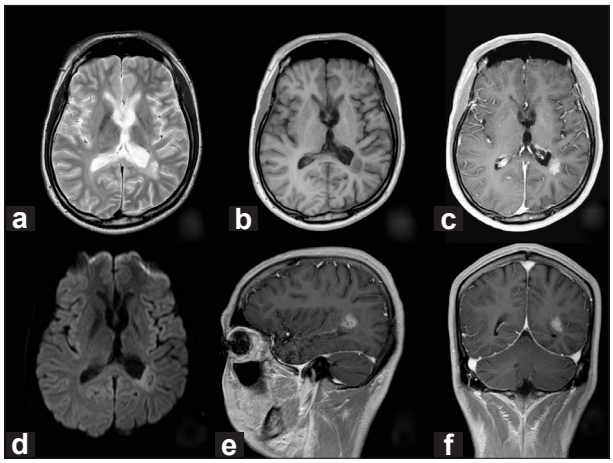


**Figure 1: Magnetic resonance imaging revealing a solitary mass lesion in the intraparenchymal region near the ventricular trigone. The mass of high intensity appears on both T2-weighted images (WI) and diffusion-WI (a and d), and that of low intensity on T1-WI (b). Axial, sagittal, and coronal views on T1-WI with gadolinium demonstrate homogenous enhancement of the mass lesion (c, e, and f). The left thalamus and the parietal lobe near the lesion have atrophic changes**

Navigation-guided endoscopic biopsy was performed for differential diagnosis. First, the patient's head was fixed with a Mayfield frame under general anesthesia. A transparent sheath was inserted into the front of the target lesion via the burr hole under the control of the navigation system (StealthStation®; Medtronic, Inc., Minneapolis, MN, USA) [Figure 2]. After the front of the lesion was observed with the rigid endoscope (EndoArm®; Olympus Corp., Tokyo, Japan), the lesion was removed partially with 30% of removal rate because a rapid diagnosis of probable germinoma was made by intraoperative pathology (IOP), made from a part of the photodynamic diagnosis (PDD)-positive specimen using 5-aminolevulinic acid in the targeted tissue. On histopathology, the tumor tissue contained a lot of large neoplastic cells, some of which had mitosis. Immunohistochemical examination showed the tumor cells were immunoreactive for placental alkaline phosphatase (PLAP) and c-kit, and negative for leukocyte common antigen and CD30. Syncytiotrophoblastic giant cells (STGC), which are positive for β-HCG, were not observed. The histological diagnosis was pure germinoma with a concentration of large neoplastic cells, although a typical two-cell pattern was not observed.

Totally four cycles of carboplatin and etoposide (CarE) therapy were performed. Concurrent with third cycle of the CarE therapy, 30.6 Gy of whole-brain radiotherapy was also performed. MR imaging just after the initial cycle of the CarE showed that the tumor disappeared [Figure 3]. The patient's neurological symptoms did not change during these therapies. One month after the

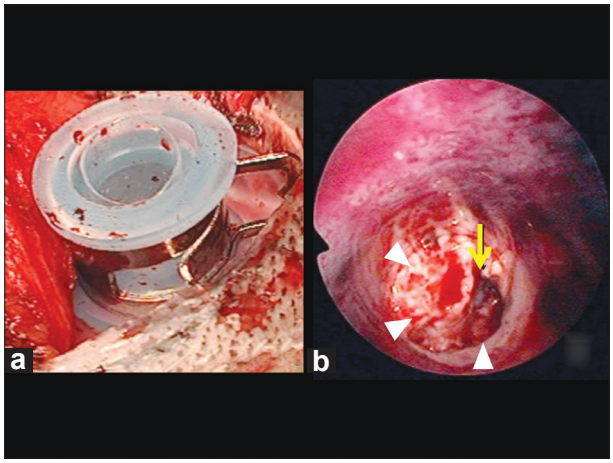


**Figure 2: Navigation-guided endoscopic biopsy performed for the differential diagnosis. (a) A transparent sheath of diameter of 10 mm (Neuroport®; Olympus Corp.) with a removable inner tube, inserted into the front of the target lesion via the burr hole under the control of the navigation system. (b) Endoscopic view using rigid endoscope (EndoArm) shows the tumor tissue (arrow heads) near the ventricle wall (arrow)**

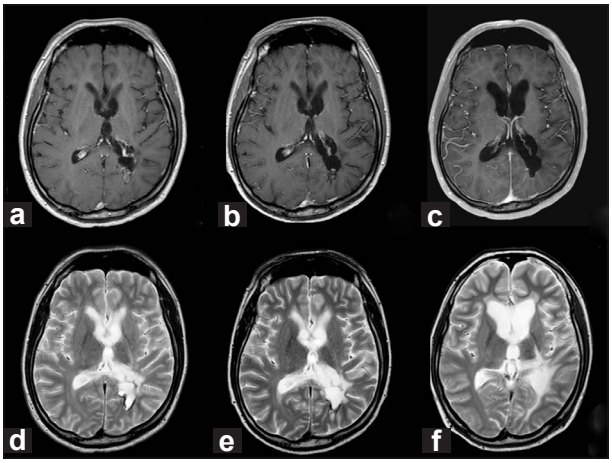


**Figure 3: Axial views on T1-weighted images (WI) with gadolinium and T2-WI after the initial cycle of chemotherapy showing that the enhanced mass has disappeared (a and d). Follow-up MR images at 5 months (b and e) and 1 year (c and f) after the surgery show no evidence of recurrence. T2-WI (f) 1 year after the surgery shows mild ventricular dilatation and high-intensity changes in the thalamus and parietal lobe**

initial therapy, he was able to walk without any assistance and had no deterioration of transcortical motor aphasia or amnesia (80% of KPS). Follow-up MR imaging and Thallium 201 single-photon emission CT 1 year after the initial therapy showed no evidence of recurrence or dissemination.

## DISCUSSION

In the present case, the solitary germinoma was located in the intraparenchymal region near the ventricular trigone. To our knowledge, this is a particular case of intraparenchymal germinoma, although there were multiple cases of BG germinoma[11,14,17,22] and limited cases of GCT located in multiple regions extending into the ventricular trigone[4,19] in the previous reports. It has been proposed that nongonadal GCTs arise from ectopic primordial germ cells[20] and migration error can occur in any intraparenchymal region including BG. On the other hand, subependymal infiltration was suggested in a previously reported case with a synchronous lesion at BG and para-lateral ventricle.[23] We speculate that in our case the ventricular trigone germinoma occurred solitary owing to the migration error theory; however, we cannot deny a possibility of subependymal infiltration from a BG lesion undetectable on MR imaging.

Intracranial germinomas located in the common regions, pineal region and the neurohypophysis, are considered to be curable.[3,6,15] In contrast, patients with BG germinomas have high rate of treatment failure.[22,17] In the present case, we considered that the intraparenchymal germinoma might have a high rate of treatment failure, similar to BG germinomas. Thus, the sequential whole-brain irradiation and multiple cycles of CarE chemotherapy, which are considered to be the optimal treatment for BG germinomas,[22] were applied in the present case.

Needle biopsy is useful for tissue sampling of intraparenchymal tumors of the CNS, such as glioma. However, in the case of germinoma, misdiagnosis as a granulomatous lesion or other type of GCTs often occurs,[5,10] probably due to the sampling error and the small amount of sampled tissue. Recently, the navigation-guided endoscopic biopsy has been used to overcome the drawbacks of needle biopsy and open biopsy via small craniotomy.[2,24] In this new biopsy, operators can modify the position under visual control with the endoscope and after IOP with the PDD, which increases the accuracy of the sampling target point.[24] With the new technique, it is possible to resect a larger volume of pathological tissue in various locations without the risk of bleeding. Indeed, in the present case, we could obtain a relatively large tumor sample with the adequate hemostasis under visual control. As minor disadvantages of the navigation-guided endoscopic biopsy, this method has longer operation time (2.2 h vs. 1.0 h) and theoretically larger approach-related brain damage than those in the needle biopsy. However actual severe complication rate in the former was not higher than that in the latter.[24] Moreover, in handling the pial regions containing many vessels, microscopic visualization is superior to endoscopic visualization. Stereotactic needle biopsy and/or microscopic open surgery via craniotomy are more suitable in the basal ganglia and brain stem. Thus, the navigation-guided endoscopic biopsy can be a useful technique in some types of intraparenchymal tumor cases.

## REFERENCES


1. Aguila LA, Chou SM, Bay JW. Primary intracranial germinoma presenting as lower cranial nerve involvement: Case report and review of the literature. Neurosurgery 1984;14:475-9.
2. Akai T, Shiraga S, Sasagawa Y, Okamoto K, Tachibana O, Lizuka H. Intraparenchymal tumor biopsy using neuroendoscopy with navigation. Minim Invasive Neurosurg 2008;51:83-6.
3. Aoyama H, Shirato H, Ikeda J, Fujieda K, Miyasaka K, Sawamura Y. Induction chemotherapy followed by low-dose involved-field radiotherapy for intracranial germ cell tumors. J Clin Oncol 2002;20:857-65.
4. Arita K, Uozumi T, Ogasawara H, Sugiyama K, Ohba S, Pant B, *et al*. [A case of pineal germinoma presenting with severe amnesia]. No Shinkei Geka 1995;23:271-5.
5. Echevarría ME, Fangusaro J, Goldman S. Pediatric central nervous system germ cell tumors: A review. Oncologist 2008;13:690-9.
6. Matsutani M. Japanese pediatric brain tumor study group. Combined chemotherapy and radiation therapy for CNS germ cell tumors—The Japanese experience. J Neurooncol 2001;54:311-6.
7. Matsutani M. Clinical management of primary central nervous system germ cell tumors. Semin Oncol 2004;31:676-83.
8. Matsutani M, Sano K, Takakura K, Fujimaki T, Nakamura O, Funata N, *et al*. Primary intracranial germ cell tumors: A clinical analysis of 153 histologically verified cases. J Neurosurg 1997;86:446-55.
9. Matsuyama Y, Nagasaka T, Mimatsu K, Inoue K, Mii K, Iwata H. Intramedullary spinal cord germinoma. Spine (Phila Pa 1976) 1995;20:2338-40.
10. Murakami M, Kuratsu J, Kochi M, Kunitoku N, Hashiguchi A, Ushio Y. Pineal germinomas with granulomatous inflammation. Report of two cases and review of the literature. Neurosurg Focus 1998;5:e5.
11. Nagata K, Nikaido Y, Yuasa T, Fujimoto K, Kim YJ, Inoue M. Germinoma causing wallerian degeneration. Case report and review of the literature. J Neurosurg 1998;88:126-8.
12. Nagendran K, Rice-Edwards M, Kendall B, Barnard RO, Guiloff RJ. Germinoma in the cerebellopontine angle. J Neurol Neurosurg Psychiatry 1985;48:955-6.
13. Nakajima H, Iwai Y, Yamanaka K, Yasui T, Kishi H. Primary intracranial germinoma in the medulla oblongata. Surg Neurol 2000;53:448-51.
14. Okamoto K, Ito J, Ishikawa K, Morii K, Yamada M, Takahashi N, *et al*. Atrophy of the basal ganglia as the initial diagnostic sign of germinoma in the basal ganglia. Neuroradiology 2002;44:389-94.
15. Osuka S, Tsuboi K, Takano S, Ishikawa E, Matsushita A, Tokuuye K, *et al*. Long-term outcome of patients with intracranial germinoma. J Neurooncol 2007;83:71-9.
16. Packer RJ, Cohen BH, Cooney K. Intracranial germ cell tumors. Oncologist 2000;5:312-20.
17. Phi JH, Cho BK, Kim SK, Paeng JC, Kim IO, Kim IH, *et al*. Germinomas in the basal ganglia: Magnetic resonance imaging classification and the prognosis. J Neurooncol 2010;99:227-36.
18. Report of brain tumor registry of Japan (1984-2000) 12th Edition. Neurol Med Chir (Tokyo) 2009;49 Suppl:S1-96.
19. Rushing EJ, Sandberg GD, Judkins AR, Vezina G, Kadom N, Myseros JS, *et al*. Germinoma: Unusual imaging and pathological characteristics. Report of two cases. J Neurosurg 2006;104 Suppl 2:143-8.
20. Schneider DT, Schuster AE, Fritsch MK, Hu J, Olson T, Lauer S, *et al*. Multipoint imprinting analysis indicates a common precursor cell for gonadal and

nongonadal pediatric germ cell tumors. Cancer Res 2001;61:7268-76.
21. Shibata Y, Matsuda M, Suzuki K, Matsumura A. Cystic neurohypophysial germinoma associated with moyamoya disease. Neurol Sci 2010;31:189-92.
22. Sonoda Y, Kumabe T, Sugiyama S, Kanamori M, Yamashita Y, Saito R, *et al*. Germ cell tumors in the basal ganglia: Problems of early diagnosis and treatment. J Neurosurg Pediatr 2008;2:118-24.
23. Takano S, Osuka S, Mashiko R, Matsumura A. [Case report of germinoma with synchronous lesions in the thalamus and para lateral ventricle.] No Shinkei Geka 2008;36:541-5.
24. Tsuda K, Ishikawa E, Zaboronok A, Nakai K, Yamamoto T, Sakamoto N, *et al*. Navigation-guided endoscopic biopsy for intraparenchymal brain tumor. Neurol Med Chir (Tokyo) 2011;51:694-700.