

STEREOTACTIC OPEN CRANIOTOMY FOR A THALAMIC GERMINOMA: REPORT OF A CASE

BİR TALAMİK GERMINOMA OLGUSUNUN STEREOTAKTİK AÇIK KRANIOTOMİ İLE ÇIKARILMASI: OLGU SUNUMU

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ABSTRACT : Germinoma is the most common type of intracranial germ cell tumors but its thalamic presentation is rare. For the treatment of deep-seated cerebral lesions like this, stereotaxy-guided microsurgery offers advantages in surgical orientation, localization and safe resection. Stereotactic open craniotomy for a thalamic germinoma with its microsurgical removal and the good outcome of the patient were described.

Key Words: Thalamic Germinoma, Stereotactic Open Craniotomy, Stereotactic Surgery.

ÖZET : Germinoma intrakranial germ hücre tümörlerinin en sık görülenidir ve talamik yerleşimi nadirdir. Bunun gibi derin yerleşimli serebral lezyonların tedavisinde stereotaksik mikrocerrahi, cerrahi oryantasyonda, lokalizasyonda ve güvenli rezeksiyonda avantajlar sağlar. Bir talamik germinoma olgusunun stereotaksik açık kraniotomi ile mikrocerrahi olarak çıkarılması ve hastanın iyi prognozu sunuldu.

Anahtar Kelimeler: Talamik Germinoma, Stereotaksik Açık Kraniotomi, Stereotaksik Cerrahi.

INTRODUCTION

Germ cell tumors are central nervous system tumors derived from primordial germ cells found along the embryonic midline, accounting for 0.5-2.0 percent of all primary intracranial tumors (1, 2). Among these neoplasms, germinoma is the most common type, comprising approximately 70 percent of all intracranial germ cell tumors, and holds the best prognosis (3). Computerized tomography (CT) and magnetic resonance imaging (MRI) are valuable in showing the localizations of germinomas. Surgery, radiation therapy and chemotherapy are all important in the management.

The advantages and accuracy of stereotaxy for performing craniotomies, biopsies and microsurgical resection of brain tumors are well known by neurosurgeons (4). Stereotaxy-guided microsurgery offers significant advantages for the

treatment of deep-seated cerebral lesion and for lesions that cannot be localized because of their small size or lack of evident landmarks (5).

We report a case of excision of a thalamic germinoma using stereotaxy-guided craniotomy and microsurgical resection technique.

CASE REPORT

A 41-year-old man was admitted to our hospital with headache, vomiting and weakness of the right arm and foot. Neurological examination revealed palsy of the left abducens nerve and severe right hemiparesis. MRI showed a left spherical thalamic tumor infiltrating the basal ganglia (Fig. 1A,B). Human chorionic gonadotropin (HCG) and alpha fetoprotein (AFP) levels of cerebrospinal fluid (CSF) and serum were normal.

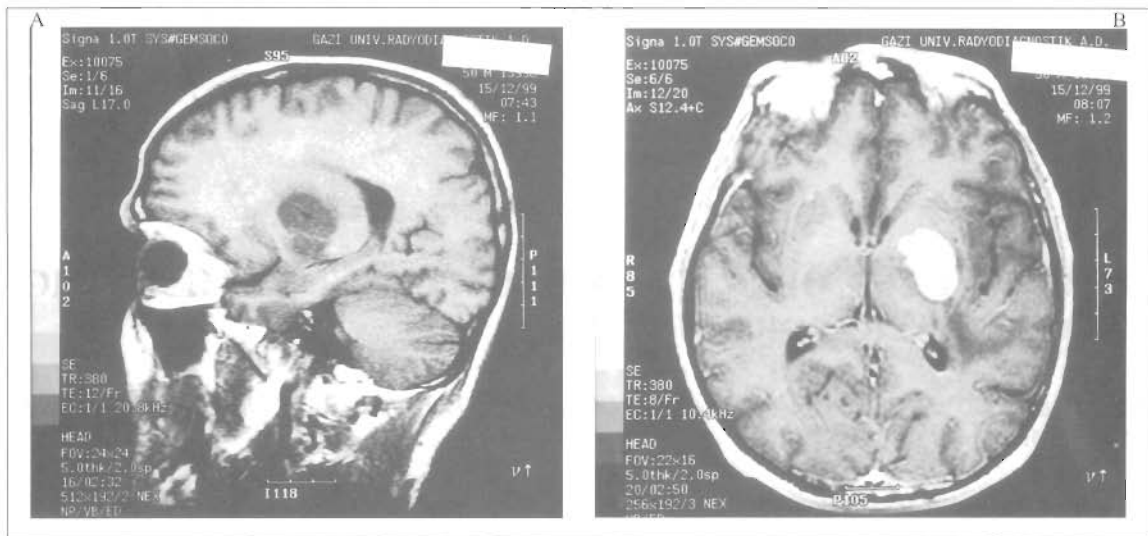


Fig. 1: Left thalamic hypointense spherical lesion infiltrating the basal ganglia on T-1 weighted sagittal MRI (A). Tumor showing marked enhancement after infusion of contrast agent on T-1 weighted axial MRI (B).

Since conventional surgical techniques would not be sufficient for accurate localization, we performed a stereotactic open craniotomy and microsurgical resection of the tumor. First of all under local anesthesia, the stereotactic head frame was placed on the patient's head with four pins in such a position that the frame would not be an obstacle to the craniotomy. The patient was carried to the CT room and contrast-enhanced CT images were obtained (Fig. 2). By using software of the stereotactic system, the fiducial markers visualised on the CT images and the coordinates of the center of the tumor were computed and a trajectory was calculated by the help of cartesian

coordinates x, y, z. The patient was then taken to the operating room and intubated with an endotracheal tube under general anesthesia. The base ring was attached to the operating table and a good position for craniotomy was achieved by raising the head of the table. After draping the patient, the stereotactic aiming bow was placed and the stereotactic probe was used to plan a craniotomy. The scalp was opened with a linear incision parallel to the sagittal suture in the left frontal region. After the stereotactic probe had been directed through the centre of the planned craniotomy, a 4-centimeter craniotomy was performed and dura was opened in a Y-shape. A transsulcal-subcortical incision was made microsurgically. Following the trajectory probe and retracting the brain tissue by Leyla retractors, we reached the gliotic surrounding tissue in the depth of the frontal lobe. The thalamic tumor infiltrating the basal ganglia came into the view of the microscope and the tumor was resected. After homeostasis the dura was closed in watertight fashion. The craniotomy flap was put in place and no epidural drain was used. The skin was closed by skin staplers and all the stereotactic apparatus was removed.

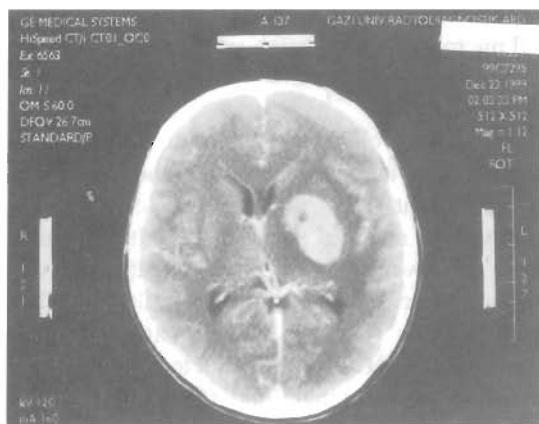


Fig. 2: Contrast-enhanced CT image for calculating the trajectory.

The pathological examination revealed the diagnosis as germinoma and radiation therapy was given to his craniospinal axis. The postoperative course was uneventful, a remarkable recovery in his right hemiparesis was observed gradually and no sign of tumor was

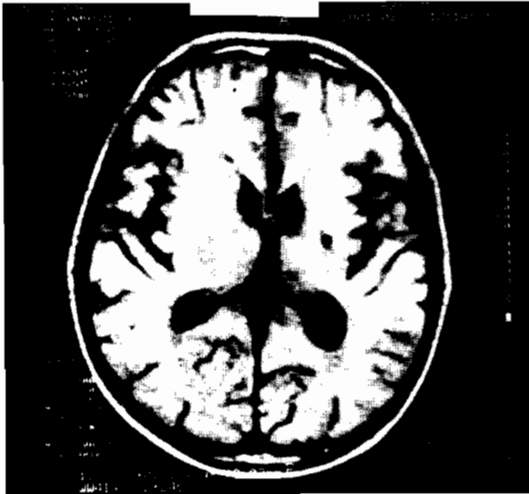


Fig. 3: No evidence of tumor on fifteen months follow up axial MRI.

seen on control MRI (Fig. 3).

DISCUSSION

Intracranial germ cell tumors represent less than 2 percent of the intracranial tumors and affect primarily children and adults (2, 6). The most frequent histological type is germinoma (3). Germinomas may occur in the region of the pineal gland, the suprasellar-retrochiasmal area, the cerebellar vermis, the posterior third ventricular, interpeduncular and quadrigeminal plate regions, the walls of the lateral and third ventricles and the thalamus.

Thalamic presentation of germinomas is rare. The incidence is estimated as nearly 10 percent of all intracranial germinomas and the sex incidence shows a male dominance (7). Common symptoms and signs are hemiparesis, eye symptoms, fever of unknown origin, convulsions, pubertas praecox, psychiatric signs, diabetes insipidus and signs of increased intracranial pressure. The combination of CT and MRI findings allows early detection and appropriate diagnosis of the mass in the thalamus and basal ganglia (8). MRI of the thalamic germinoma shows a paraventricular mass, intratumoral cystic areas, focal hemorrhages and ipsilateral cerebral hemiatrophy. Some germinomas tend to secrete the tumor markers hCG and AFP and then may be diagnosed clinically due to the increased serum or CSF levels (9).

For the accurate histopathological diagnosis of an intracranial germ cell tumor, surgery is required, but a group of tumors secrete hCG and AFP, which may obviate the need for surgical intervention (6). Germinomas can be effectively treated with radiation therapy. After surgical resection and radiation therapy long-term survival of intracranial germinomas amounts to 88 % (10). As the tendency of germinomas to disseminate through the CSF is well known, radiation therapy must be delivered to the craniospinal axis (11). Germinomas are also chemosensitive, so addition of chemotherapy to radiation therapy may improve the rate of survival (6).

Stereotactic techniques have been applied to guide surgical approaches to intracranial targets defined by either functional or anatomical characteristics. Functional stereotaxy is for movement disorders, pain, psychosurgery, epilepsy and morphologic stereotaxy aims at tumors, aneurysms, hydrocephalus, epilepsy and pain. In morphologic stereotaxy, the mass is shown with radiological imagings and using software technology, a target is calculated according to the stereotactic head frame by the help of cartesian coordinates x, y, z. Surgery is then performed according to this target. In functional stereotaxy, the object is to treat disease by modulating function in normal structures or to normalize malfunctioning structures.

Frameless stereotactic systems (Interactive Image-Guided Neurosurgery) and frame based stereotactic systems are the two stereotactic systems for performing surgical approaches. Frame based systems are cheaper and more common, since no expensive, special devices and equipment are needed. For good surgical orientation and precise localization, frame based systems are useful because of their accuracy. In our case, in order to localize the deep-seated germinoma for microsurgery, we used frame based stereotactic systems and morphologic stereotaxy.

Exact localization of the tumor is one aim, while another is to avoid damaging normal brain structures. The accuracy of microsurgical tumor resection achieved by stereotaxy means a significant reduction in postoperative neurological deficits.

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