Journal of Clinical Neuroscience 38 (2017) 23–31

Contents lists available at ScienceDirect

Journal of Clinical Neuroscience

journal homepage: www.elsevier.com/locate/jocn

Review article

Pineal germ cell tumors: Two cases with review of histopathologies and biomarkers

Daniel T. Nagasawa [a], Carlito Lagman [a], Michael Sun [a], Andrew Yew [a], Lawrance K. Chung [a], Seung J. Lee [a], Timothy T. Bui [a], Yinn Cher Ooi [a], R. Aaron Robison [e], Gabriel Zada [e], Isaac Yang [a,b,c,d,*]

[a] Department of Neurosurgery, David Geffen School of Medicine, University of California, Los Angeles, Los Angeles, CA, United States
[b] Department of Radiation Oncology, David Geffen School of Medicine, University of California, Los Angeles, Los Angeles, CA, United States
[c] Department of Head and Neck Surgery, David Geffen School of Medicine, University of California, Los Angeles, Los Angeles, CA, United States
[d] Jonsson Comprehensive Cancer Center, University of California, Los Angeles, Los Angeles, CA, United States
[e] Department of Neurosurgery, Keck School of Medicine of the University of Southern California, Los Angeles, Los Angeles, CA, United States

ARTICLE INFO

Article history:
Received 5 October 2016
Accepted 27 December 2016

Keywords:
Germinoma
Germ cell tumor
Intracranial neoplasms
Pathology
Yolk sac tumor

ABSTRACT

Pineal germ cell tumors (GCTs) are primarily seen in pediatric and Asian populations. These tumors are divided into germinomatous and non-germinomatous GCTs (NGGCTs). GCTs are thought to arise by misplacement of totipotent stem cells en route to gonads during embryogenesis. Intracranial GCTs display an affinity to develop along the pineal-suprasellar axis and have variable manifestations dependent upon the location of the tumor. Management and outcomes are driven by histopathologies. In this study, we highlight two cases of pineal GCTs and present a review of the literature with an emphasis on histopathologies and biomarkers.

© 2016 Published by Elsevier Ltd.

1. Introduction

Pineal germ cell tumors (GCTs) are rare, comprising less than 5% and 18% of primary brain tumors in Western and Asian countries, respectively [1–8]. Pineal GCTs account for nearly 50% of intracranial GCTs (IGCTs) and are more common in males [8]. Histologically, these tumors are categorized as germinomatous or non-germinomatous [1]. Germinomatous GCTs include germinomas and germinomas with syncytiotrophoblastic giant cells (STGCs). Non-germinomatous GCTs (NGGCTs) include teratomas, embryonal carcinomas, yolk sac tumors, and choriocarcinomas [9].

IGCTs commonly develop along the pineal-suprasellar axis. Computed tomography (CT) demonstrates punctate hyperdensities, which indicate tumoral calcifications embedded in a hypodense, enhancing mass [10,11]. Magnetic resonance imaging (MRI) remains the diagnostic modality of choice, and reveals a T1- and T2-isointense vividly enhancing mass. Management and prognoses of these tumors are driven by histopathological subtype.

Advances in immunohistochemistry and next-generation sequencing have furthered our understanding of the origin and pathomolecular mechanisms underlying the development of GCTs. DNA damage response (DDR) signaling and the ATM-ChK2-p53 pathway, which are involved in the development of solid tumors, have been shown to be downregulated in germinomas and other subtypes of primary GCTs [12]. This pattern is also observed in testicular GCTs. Mutations in the KIT/RAS and AKT1/mTOR pathways, among others, have also been demonstrated in IGCTs [8]. Here we report two cases of pineal GCTs (yolk sac tumor and germinoma). The literature is reviewed with an emphasis on histopathologies and biomarkers.

2. Cases

All patients gave informed consent for the treatments described below. Institutional Review Boards at each respective institution did not require consent for this type of article. Nevertheless, details that might disclose the identities of the subjects are omitted. Permission to reproduce images was appropriately obtained. The slides depicted in this paper are not from the patients herein described and are for non-CNS GCTs.

* Corresponding author at: Department of Neurosurgery and Jonsson Comprehensive Cancer Center, University of California, Los Angeles, 300 Stein Plaza, Suite 562, 5th Floor Wasserman Building, Los Angeles, CA 90095-1761, United States. Fax: +1 310 825 9384.
E-mail address: iyang@mednet.ucla.edu (I. Yang).

http://dx.doi.org/10.1016/j.jocn.2016.12.024
0967-5868/© 2016 Published by Elsevier Ltd.

2.1. Pineal germinoma (Case 1)

A 20-year-old male initially presented to an optometrist with a one-month history of decreased left eye visual acuity, headache, nausea, and erectile dysfunction. The patient was referred to an external neuro-ophthalmology department for further care.

Neurologic examination revealed decreased visual acuity and papilledema. Brain MRI showed mild hydrocephalus and a $1 \times 1 \times 1$ cm round, heterogeneously enhancing pineal lesion. Diffusion-weighted imaging (DWI) demonstrated restricted diffusion at the anterolateral edge of the mass. Gradient recalled echo (GRE) images showed areas of hypointensity attributed to calcification. Several small lesions were present in the hypothalamus, left foramen of Monro, the right lateral recess of the fourth ventricle, floor of the fourth ventricle at the facial colliculus, and obex. Spine MRI demonstrated enhancing drop lesions in the sacral region (images unavailable). Serum α-fetoprotein (AFP) and β-human chorionic gonadotropin (β-hCG) were within normal limits.

The patient underwent placement of a ventriculoperitoneal shunt (VPS) and an endoscopic transventricular biopsy via a right frontal neuro-endoscopic approach. Histopathological diagnosis was germinoma and confirmed by immunohistochemistry (IHC) (slides unavailable). IHC was positive for placental alkaline phosphatase (PLAP), octamer-binding transcription factor 4 (Oct-4), and c-kit (CD117). Staining was negative for glial fibrillary acidic protein (GFAP), synaptophysin, and cytokeratins.

As the patient was on vacation in California from Great Britain, he requested to be transferred home for further management. His visual disturbances resolved and he was discharged in stable condition.

2.2. Pineal yolk sac tumor (Case 2)

A 23-year-old male with a rapidly enlarging pineal tumor presented at an outside hospital with hydrocephalus status post VPS. The patient subsequently developed fevers, mental status deterioration, respiratory failure, and hypotension. He was transferred to our institution for escalation of care. On exam, he intermittently followed commands. Given the concern for infection, the VPS was removed and ventriculostomy was subsequently performed. Cerebrospinal fluid (CSF) cultures were negative. Prolonged fevers and fluctuating serum white blood cell counts were attributed to a sympathetic storm.

Head CT revealed an enhancing, heterogeneously hyperdense, and partially calcified $3 \times 4 \times 4$ cm irregularly shaped pineal mass. Brain MRI showed a heterogeneously enhancing pineal tumor containing multiple T1- and T2-hypointense foci consistent with calcifications (images unavailable). Obstructive hydrocephalus was attributed to aqueductal stenosis caused by the pineal mass. Elevated levels of CSF AFP (599 ng/mL, normal: 0.0–6.7) and lactate dehydrogenase (LDH) (278 U/L, normal: 91-223) were found and consistent with a diagnosis of yolk sac tumor. hCG levels were not reported.

Due to location and extent of involvement, the patient's tumor was deemed unresectable. He was treated with chemotherapy (carboplatin and etoposide) to which he demonstrated radiographic response on follow-up imaging. The hydrocephalus persisted and he required repeat VPS. Neurological examination at discharge revealed spontaneous eye opening with the patient alert, following commands, and mouthing words. Strength remained severely diminished in all four extremities. He was discharged to an acute rehabilitation facility for local hematology/oncology follow-up.

3. Discussion

In this report, we described two cases of pineal GCTs. These patients provided the rationale for conducting a review of the literature with an emphasis on histopathologies and biomarkers. The PubMed database was queried using relevant search terms. A total of 298 IGCTs, comprised of 193 germinomas (64.8%), 52 teratomas (17.4%), 20 choriocarcinomas (6.7%), 19 yolk sac tumors (6.4%), and 14 embryonal carcinomas (4.7%) were identified (Table 1). Our analysis represents the aggregated data from the literature that investigated tumor marker expression patterns in serum and CSF (Table 2) and IHC staining of histologically pure GCTs (Table 3).

Table 1
Quantitative summary of studies evaluating intracranial germ cell tumor markers.

Authors and year [Ref]	Germinoma	Teratoma	Embryonal carcinoma	Yolk sac tumor	Choriocarcinoma
Lv et al. (2010) [53]	–	–	–	–	6
Ngan et al. (2008) [60]	5	4	–	3	–
Kamakura et al. (2006) [40]	13	4	–	2	2
Nakamura et al. (2006) [58]	25	2	1	2	–
Hattab et al. (2005) [28]	25	–	–	–	–
Matsutani et al. (1997) [55]	36	18	4	3	3
Ho et al. (1992) [29]	23	8	–	5	2
Inoue et al. (1987) [32]	39	6	4	–	2
Yamagami et al. (1987) [85]	9	7	2	3	2
Bjornsson et al. (1985) [11]	16	3	1	1	1
Allen et al. (1979) [4]	2	–	2	–	2
Total, *n* (%)	193 (64.8)	52 (17.4)	14 (4.7)	19 (6.4)	20 (6.7)

Table 2
Elevated serum and cerebrospinal fluid markers in cases reviewed.

Histopathologies	Serum AFP, *n* (%)	CSF AFP, *n* (%)	Serum hCG, *n* (%)	CSF hCG, *n* (%)
Germinoma	1 (2)	0 (0)	13 (25)*	8 (73)
Teratoma	4 (17)	0 (0)	5 (22)	0 (0)
Embryonal carcinoma	5 (56)	4 (80)	4 (44)	4 (80)
Yolk sac tumor	3 (100)	–	0 (0)	–
Choriocarcinoma	1 (17)	1 (33)	11 (85)	3 (100)

* Expression is associated with germinoma with syncytiotrophoblastic giant cells.

Download English Version:

https://daneshyari.com/en/article/5629784

Download Persian Version:

https://daneshyari.com/article/5629784

Daneshyari.com