CNS TUMORS AT AKU: AN UPDATE PLUS A BRIEF DISCUSSION ON INTRAVENTRICULAR TUMORS WITH SPECIAL EMPHASIS ON CENTRAL NEUROCYTOMA.

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Background: This paper is intended to be an update of our earlier published work on CNS tumors along with additional information on intraventricular tumors. Three cases of central neurocytoma are also discussed. **Methods:** An analysis conducted in the Section of Histopathology, AKU to determine the frequency of all CNS neoplasms diagnosed between Jan 1, 1994 and Dec 31, 2001. Frequency of intraventricular tumors was also determined. Histological characterization of the tumors was based on the WHO and AFIP (USA) classification systems for CNS tumors. **Results:** A total of 1677 CNS tumors were diagnosed during the study period. 1510(90.04%) were primary, and 167(9.96%) were metastatic. Among the primary tumors, gliomas constituted the largest category with 825 cases or 54.63% of all primary tumors. Meningothelial tumors comprised the second largest group with 364 cases or 24.10%. among other major categories, embayonal tumors, and peripheral nerve sheath tumors comprised 6.75% and 6.82% of all primary tumors. Among less common tumors, Non-Hodgkin's lymphomas and hemangioblastomascomprised 3.11% and 1.52% of all CNS tumors. Intraventricular tumors comprised 7.41% of all primary tumors. Ependymomas comprised 64.28% of all Intraventricular tumors. **Conclusions:** Gliomas and meningothelial tumors are the commonest group of primary CNS tumors. Metastatic tumors are quite common.

KEY WORDS: Gliomas, astrocytomas, meningiomas, metastatic tumors, intraventricular tumors, central neurocytoma.

INTRODUCTION

According to initial results from Karachi Cancer Registry, CNS neoplasms rank at No.14 among all malignant tumors in both sexes [1]. This paper is intended to be an update on our earlier published work [2]. We have extended our series of CNS neoplasms [(2)] to a period of eight years, adding the tumors diagnosed in the years 2000 and 2001. These two years saw a significant increase in the number of neurosurgical specimens submitted to us for histopathology. This increase may reflect an increasing awareness among clinicians of a need for an accurate histopathological examination. In addition, we have also determined the frequency of intraventricular tumors in our series. In this paper, we have also discussed central neurocytoma, a relatively new intraventricular tumor, three cases of which have been seen by us in the last three years.

MATERIALS AND METHODS

An analysis was conducted in the section of Histopathology, AKU to determine the frequency of all CNS neoplasms diagnosed over a period of eight years from 1st Jan, 1994 to 31st Dec, 2001. Among these lesions, the frequency of Intraventriculartumors was also determined. All specimens had been fixed in 10% buffered formalin, routinely processed under standardized conditions for paraffin embedding, sectioned and stained with Hematoxylin and Eosin using standard procedures. When required, special stains such as PAS, Reticulin etc and Immunohistochemistry using monoclonal antibodies against GFAP, EMA, Cytokeratins, LCA etc were performed. The histological characterization of these tumors was based on the WHO [3] and AFIP (USA) [4] classification systems.

Pituitary neoplasms such as adenomas and craniopharyngiomas were excluded as were non-neoplastic lesions including various types of cysts and vascular malformations etc.

The tumors which may be Intraventricular in location include: Ependymoma, Subependymoma, Subependymal giant cell astrocytoma, choroid plexus tumors, pilocytic astrocytomas, Central neurocytoma, pineal parenchymal tumors and germ cell tumors.

RESULTS

A total of 1677 CNS neoplasms were diagnosed during the 8 year study period. Of these, 1510 (90.04%) were primary, and 167(9.96%) were metastatic.

Of the 1510 primary tumors, tumors of the neuroglia (including those of choroid plexus epithelium) comprised the largest category with 825 cases or 54.63% of all primary tumors. (Table 1)

Meningothelial tumors comprised the second largest group with 364 cases or 24.10% of all primary tumors (Table 2). Among other major categories, embryonal tumors, neuronal and glioneuronal tumors and peripheral nerve sheath tumors comprised 6.75%, 1.32% and 6.82% of all primary tumors respectively (Table 3, 4, 5). Less common tumors were grouped together as miscellaneous. Among these, Non Hodgkin's lymphoma and Hemangioblastoma were significant, 3.11% and 1.52% of all CNS tumors respectively (Table 6).

Intraventricular tumors include tumors from multiple histologic groups. These tumors comprised only a small percentage of our series i.e. 7.41% of all primary tumors; among these ependymomas were the commonest comprising 64.28% of all intraventricular tumors (Table 7).

Table 1: Tumors of neuroglia and choroid plexus epithelium (n=825)

HISTOLOGICAL TYPE	NO. & %*
Low Grade Astrocytoma	115 (13.93%)
High Grade Astrocytoma (includes anaplastic astrocytoma and Glioblastoma Multiforme)	351 (42.54%)
Gliosarcoma	16 (1.93%)
Pilocytic Astrocytoma	102 (12.36%)
Pleomorphic Xanthoastrocytoma	7 (0.84%)
Subependymal gaint cell astrocytoma	2 (0.24%)
Oligodendroglioma (45 anaplastic)	130 (15.75%)
Ependymoma (17 anaplastic plus 3 Myxopapillary)	72 (8.72%)
Mixed Glioma	23 (2.78%)
Choroid plexus papilloma	3 (0.36%)
Choroids plexus carcinoma	2 (0.24%)
Subependymoma	1 (0.12%)
Astroblastoma	1 (0.12%)

** of all neuroglial and choroid plexus epithelium tumors.*

Table 2: Tumors of meningothelial cells (n=364)

HISTOLOGICAL TYPE	NO. & % *
Meningioma	332 (91.21%)
Atypical Meningioma	18 (4.94%)
Malignant Meningioma	14 (3.84%)

** of all meningothelial tumors.*

Table 3: Embryonal tumors (n = 102)

HISTOLOGICAL TYPE	NO. & %*
Medulloblastomas	74 (72.54%)

(including 3 Desmoplasticmedulloblastomas)	
Neuroblastoma	15 (14.70%)
PNET	13 (12.74%)

** of all Embryonal tumors.*

Table 4: Neuronal and glioneuronal tumors (n=20)

HISTOLOGICAL TYPE	NO. & % *
Ganglioma	17 (85%)
Central Neurocytoma	3 (15%)

** of all neuronal and glioneuronal tumors.*

Table 5: Tumors of peripheral nerve sheath (n=103)

HISTOLOGICAL TYPE	NO. & %*
Schwannoma	99 (96.11%)
Neurofibroma	4 (3.88%)

** of all peripheral nerve sheath tumors.*

Table 6: Miscellaneous tumors (n=96)

HISTOLOGICAL TYPE	NO. & % *
NHL	47 (3.11%)
Germ Cell Tumors	11 (0.72%)
Hemangioblastoma	23 (1.52%)
Pineal parenchymal tumors	3 (0.19%)
Rhabdomyosarcoma	8 (0.53%)
chordoma	1 (0.06%)
Malignant Melanoma	2 (0.13%)
Hemangiopericytoma	1 (0.06%)

** of all primary CNS tumors.*

Table 7: Intraventricular tumors (n=112)

HISTOLOGICAL TYPE	NO. & % *
Ependymoma	72 (64.28%)
Subependymoma	1 (0.89%)
Subependymal giant cell astrocytoma	2 (1.78%)
Pilocytic astrocytoma	15 (13.39%)
Choroid plexus tumors	5 (4.46%)
Central Neurocytoma	3 (2.67%)
Pineal parenchymal tumors	3 (2.67%)
Germ Cell tumors	11 (9.82%)

** of all Intraventricular tumors*

DISCUSSION

As in our earlier series[2], neuroglial tumors again comprise the largest group among all primary CNS tumors, followed by tumors of meningothelial cells. (see Results). Among neuroglial tumors, astrocytomas comprise the largest group and infactrepresent the commonest of all primary CNS neoplasms. These figures correspond to published Western data [5].

The Intraventricular tumors include tumors belonging to different histologic groups. The commonest among these are the ependymomas (Table 7). In our study, these tumors comprise 4.76% of all primary CNS tumors. Western studies give a figure of 5 to 7% [6]. 17 out of the 72 ependymomas (23.61%) were anaplastic. It is believed that anaplastic ependymomas which are highly cellular lesions with brisk mitotic activity alongwith vascular proliferation, are more likely to recur and at a quicker rate[7].

There were only two cases of subependymal giant cell astrocytoma, a rare neoplasm of large astrocyte-like cells which usually occurs in the setting of tuberous sclerosis. This tumor has a very slow growth rate, and prolonged survival follows even subtotal resection. The prognosis remains favorable even in the presence of mitosis, microvascular proliferation, and foci of necrosis [8].

In our eight year data, these was only a single case of Subependymoma, a highly differentiated, slow growing intraventricular tumor composed of epandymal and astrocyte like cells. The probable reason is that these tumors are most often discovered as incidental finding at autopsy and only occasional examples come to surgical attention[9].

There were 3 choroid plexus papillomas and 2 choroid plexus carcinomas in our study. All five examples occurred in children and all were located in the lateral ventricles.

Three pineoblastomas were present in our series. These were found in children. No pineocytomas were present in our data.

Of the 102 pilocytic astrocytomas in our series, 15 were intraventricular. As with pilocytic astrocytomas else where, the prognosis is excellent.

Central neurocytoma is an intraventricular tumor seen mostly in young adults. It involves mainly the lateral ventricles and produces the features of increased intracranial pressure by obstructing the flow of CSF [10, 11]. On MRI, it is seen to be centered about the septum pellucidum, is often multicystic with regions of bright enhancement, and often associated ventriculomegaly indicative of obstructive hydrocephalus.[10, 11] 3 cases were diagnosed by us in the last three years.

Fig-1: CT of central neurocytoma showing tumors as a globular intraventricular mass

Histologically, the tumor is cellular and composed of small, well differentiated mature neurocytes embedded in a variably abundant, delicate fibrillary background matrix. Streaming of cells in this fibrillary background is seen. The nuclei have rounded contours; there is artificial perinuclear halo formation, a plexiform capillary arcade and calcospherites-all these impart an oligodendroglioma like appearance. Usually, mitoses, vascular proliferation or necrosis are not seen. A minority show these features-such 'atypical' neurocytomas may be associated with invasive growth or recurrence [12].

Immunohistochemically, fibrillary zones are positive for NSE (Neuron Specific Enolase), Synaptophysin and Neurofilament, and negative for chromogranin [10, 11].

The histologic differential diagnosis includes oligodendroglioma, cellular ependymoma and neuroblastoma. Oligodendroglioma is not intraventricular, there is no streaming of cells, and tumor cells are negative with Synaptophysin Cellular ependymoma is intraventricular & paraventricular rather than central and is GFAP positive, where as cells of central neurocytoma are GFAP negative. Neuroblastoma is not intraventricular, histology and immunohistochemistry are similar but there is cytologic atypia, brisk mitoses and necrosis [13].

Fig-2: Histopathological features of central neurocytoma showing uniform density of tumor cells, perinuclear halos and a fine, filbrillary background (H & E) Mag:20X

The prognosis of central neurocytoma is excellent. Complete resection can result in cure. However, residual tumor often remains. Radiation therapy is given to subtotally resected tumors [10, 14].

We reported 3 cases of central neurocytoma in the past three years. All of these were seen in young females (23-36 years). 2 were located in lateral ventricles where as the third was intraventricular but the exact site was not mentioned. Histologically all three exhibited diffuse population mature neurocytes with centrally placed rounded nuclei and stippled chromatin pattern dispersed against a fibrillary background. A clear halo was seen around the nuclei. In two cases, a network of thin walled vascular channels was seen. Immunohistochemistry was performed and tumor cells showed positivity for synaptophysin & NSE & were negative for GFAP, EMA & mic 2 in all cases. Occasional mitotic figures were noted in one case but other features warranting atypical or aggressive behaviour were not present. Perivascular Homer wright rosettes with streaming of tumor cells was also seen in one case. Calcifications or calco spherites were absent in all 3 cases.

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