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2003-2007 STUDIES OF QUALITY OUTCOMES /BRAIN TUMORS

ASTROCYTOMA

Introduction

Astrocytoma represents an important subtype of glial tumors. Its name derives from the fact that the involved cells have the appearance of "astrocytes", which along with neurons, oligodendrocytes and microglia, are one of the major cell components of the brain. Pathologists tend to reserve the term astrocytoma for those tumors that are primarily composed of astrocytic elements. Tumors that also have oligodendroglial elements are referred to as mixed oligoastocytomas.

Pathologist often use a grading system for astrocytoma tumors. The grading system is based upon how aggressive tumor cells are and how much they resemble the normal astrocyte cells. According to the World Health Organization (WHO), astrocytomas can be graded depending on their cellular characteristics; for example, Grade I (usually juvenile pilocytic type), Grade II (diffuse fibrillary, gemistocytic types), grade III (anaplastic type), or Grade IV (Glioblastoma Multiforme). Low grade astrocytomas tend to grow slowly and are usually localized to one part of the brain. Higher-grade tumors require more aggressive treatment due to the higher likelihood of recurrence and rapid growth.

Incidence

Astrocytomas account for 10.3% of all primary brain and central nervous system tumors (CBTRUS,2004). Astrocytomas are most common in children and account for 35%. Statistical Report: Primary Brain Tumors in the US, 1997-2001. Published by the Central Brain Tumor Registry of the US). Although peak incidence is in the 30-50 year old range, the disease occurs in all age groups. Males are slightly more affected. The most common presenting symptom is seizure. In contrast to the distribution of gliomas in adults, malignant gliomas account for only 20% of all childhood supratentorial gliomas.

Diagnosis

A definitive diagnosis can only be made by obtaining tissue, either with a biopsy or more extensive surgical resection. Sometimes, the diagnosis can be inferred based on MRI, but one cannot differentiate Grade II from Grade III astrocytomas on this basis, nor can one exclude the mixed forms or other gliomas subtypes.

Treatment

The grade of the tumor is used in place of a staging system to plan cancer treatment. There is no standard staging system for childhood cerebral astrocytoma. Instead, the grade of the tumor is used to plan treatment. Surgery is used only on low grade astrocytoma. Radiotherapy and chemotherapy are used for progressive cases.

At MCH from 2003 through 2007 a total of 102 Astrocytomas were diagnosed
59 were males (58%) and 43 were females (42%), making the incidence in males higher by 16%.

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MEDULLOBLASTOMA

Introduction

Medulloblastomas or (primitive neuroectodermal tumor), PNET are usually located in the cerebellum and are fast growing and highly malignant. They frequently spread, invading other parts of the CNS via the spinal fluid. Medulloblastomas account for the largest percentage of malignant pediatric brain tumors. It is more common in boys than girls; it usually occurs between the ages of 2 and 6 (only 30% of medulloblastomas occur in adults); and frequently spreads.

The incidence of pediatric CNS neoplasms is approximately 3.5 per 100,000 children per year. Medulloblastoma accounts for about 20 percent of these cases (Gurney et al. 1999). The peak occurrence is around 4 years of age (Gurney et al. 1999; Morland 1995). Up to 20% or more of cases occur in patients over 15 years of age. Boys are affected one and a half times more frequently than girls, and females have a better outcome (McNeil et al. 2002; Gurney et al. 1999; Weil et al. 1998).

Grading

The WHO classifies medulloblastomas as a malignant neuroepithelial embryonal neoplasm of the cerebellum with predominantly neuronal differentiation, distinct from other embryonal tumors, and with tendency to metastasize via CSF pathways (Kleihues and Cavenee 2000). All tumors are classified as grade IV because of their highly malignant phenotype. A variety of histologic variants of medullobalstoma have been identified to date. More recently, desmoplastic medulloblastomas and large cell medulloblastomas have been described as distinct subtypes, and the separate entity of an atypical teratoid/rhabdoid tumor has clearly been established .

Surgery

Virtually all children with a posterior fossa mass will undergo an open craniotomy. The goals of surgery are relief of mass effect, tissue diagnosis, and cytoreduction to facilitate further treatment. Children who are left with less than 1.5 cm of residual disease on postoperative imaging have an improved prognosis for long term, relapse-free survival (Zeltzer et al. 1999).

Staging

Full spine MRI with and without gadolinium is mandatory. A lumbar puncture should be obtained in the same time period to assess cytology for microscopic tumor spread. Ventricular sampling of CSF for cytology has inferior sensitivity and should not be used unless a lumbar sample absolutely cannot be obtained. A bone scan is often obtained to search for extraneural spread, but bone marrow biopsy is no longer recommended. With these findings from staging, children over age 3 years are stratified into two risk groups based on resection extent and Chang metastasis staging.

Average risk includes children with less than 1.5 cm residual and no metastasis. High risk is defined by more than 1.5 cm residual or metastatic disease.

MO No evidence of gross subarachnoid or hematogenous metastasis
M1 Microscopic tumor cells found in CSF
M2 Gross nodular seeding demonstrated in the cerebellar, cerebral subarachnoid space, or in the third or lateral ventricles.
M3 Gross nodular seeding in spinal subarachnoid space
M4 Extraneural metastasis

Treatment

Medulloblastoma is radiosensitive, and thus for many years craniospinal irradiation followed by an additional radiation boost to the posterior fossa has been the mainstay of adjuvant therapy for this tumor. 23.4 Gy craniospinal irradiation plus a boost to the posterior fossa totaling 55.2 Gy with concurrent weekly vincristine, followed thereafter by eight courses of lomustine, cisplatin, and vincristine, attained a 5-year EFS of 78%.

At MCH from 2003 through 2007 a total of 16 Medulloblastomas were diagnosed
10 were males (63%) and 6 were females (37%), the incidence in males is observed higher by 26%.

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MALIGNANT GLIOMAS

Supratentorial tumors account for 40-60% of all pediatric brain tumors, and are almost twice as common in infants as in older children (Dohrmann et al. 1985; Dropcho et al. 1987; Farwell et al. 1977). The majority of supratentorial tumors are gliomas (astrocytoma, oligodendroglioma, and ependymoma) with the most common subtype being low-grade gliomas, which constitute approximately half of this group. In contrast to the distribution of gliomas in adults, malignant gliomas account for only 20% of all childhood supratentorial gliomas.

Treatment and Prognosis

The treatment and prognosis depends on the type, grade, and location of the tumor. The grade the tumor indicates the degree of malignancy: its tendency to spread, its growth rate, and its similarity to normal cells when viewed under microscope. Tumors with distinct borders are considered "grade I", are sometimes referred to as benign or mildly malignant. These tumors either do not grow or grow very slowly. Infiltrating tumors are those that tend to grow into surrounding tissue. Of the infiltrating tumors, the terms low-grade mid-grade, and high-grade are frequently used. A "high grade" tumor is considered highly malignant. However, the exact system used to grade tumors varies with each specific family of tumors. Brain tumors are treated with surgery, radiation, and chemotherapy. Depending on the type of tumor and the promptness of diagnosis, the 5 year survival rate is 40-80%.

Surgery

The purpose of surgery is to remove as much of the tumor as possible, to establish an exact diagnosis, to determine the extent of the tumor, and sometimes to provide access for other treatments, such as implants or radiation. Some tumors are inaccessible to the neurosurgeon.

Radiation

Conventional radiation therapy uses external beams of radiation aimed at the tumor, a therapy which is over a period of several weeks.

Chemotherapy

Chemotherapy is required for the more aggressive or higher grade tumors. May drugs will kill brain cells, but it is difficult to predict which tumors will respond to which chemotherapy agents. Therefore treatment often consists of a combination of drugs. Certain classes of drugs will not pass the blood-brain barrier.

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Florida Annual Cancer Report 2004
Incidence and Mortality in Children (0-14 years)

The age-specific rates for this group were computed for a 5 year period from 2000 to 2004, and expressed in cases per million population, in contrast to all other rates in this report, were calculated per 100,000 population.

Incidence

Cancer of the brain and nervous system was one of the four highest-ranked cancers.

Mortality

The age-specific mortality rate for cancer of the brain and nervous system was the highest among Blacks.

Age-Specific Rates (1) of Top 5 Cancer Sites in *Females by Race*, Age 0-14, in Florida, 2000-2004 for Brain & Nervous System the Incidence in Florida is 33.2, in blacks 33.6 and whites 33.6. The Mortality in Florida is 6.1, in Blacks is 7.2 and Whites 6.1.

Age-Specific Rates (1) of Top 5 Cancer Sites in *Males by Race*, Age 0-14, in Florida, 2000-2004 for Brain & Nervous System the Incidence in Florida is 36.7, in Blacks 33.1, and Whites 38.1. The Mortality in Florida is 7.1, in Blacks 11.0 and Whites 6.1.

At MCH from 2003 through 2007 a total of 27 Gliomas were diagnosed 11 were males (40.74%) and 16 were females (59.26%). In our study we observed that the Malignant Gliomas had the worst survival of all.