

Introduction

A brain tumor is an intracranial solid neoplasm within the brain or the central spinal canal. Brain tumors account for 85% to 90% of all primary central nervous system(CNS)tumors (***Levin et al. ,2001***). Worldwide, approximately 176,000 new cases of brain and other CNS tumors were diagnosed in the year 2000, with an estimated mortality of 128,000 (***Parkin et al.,2001***) . Estimated new cases and deaths from brain and other nervous system tumors in the United States in 2010(***American Cancer Society,2010***):New cases: 22,020 Deaths: 13,140. the incidence of primary brain tumors is higher in whites than in blacks, and mortality is higher in males than in females(***Levin et al.,2001***).

Anaplastic astrocytoma and glioblastoma account for approximately 38% of primary brain tumors; meningiomas and other mesenchymal tumors account for approximately 27%(***Levin et al.,2001***).Other less common primary brain tumors include pituitary tumors, schwannomas, CNS lymphomas, oligodendrogliomas, ependymomas, low-grade astrocytomas, and medulloblastomas, in decreasing order of frequency. Schwannomas, meningiomas, and ependymomas account for as much as 79% of primary spinal tumors (***Preston-Martin S,1990***). Other less common primary spinal tumors include sarcomas, astrocytomas, vascular tumors, and chordomas, in decreasing order of frequency. The familial tumor syndromes (and respective chromosomal abnormalities that are associated with CNS neoplasms) include neurofibromatosis type I (17q11), neurofibromatosis type II (22q12), von Hippel-Lindau disease (3p25-26), tuberous sclerosis (9q34, 16p13), Li-Fraumeni syndrome (17p13), Turcot syndrome type 1 (3p21, 7p22), Turcot syndrome type 2

(5q21), and nevoid basal cell carcinoma syndrome (9q22.3) (*Behin et al., 2003 and Kleihues et al., 2000*).

Magnetic resonance (MR) imaging and MR Spectroscopy plays an important role in the detection and evaluation of brain tumors. To date, MR imaging has principally served the role of showing the neoplasm, helping distinguish tumors from other pathologic processes, and depicting basic signs of tumor response to therapy, such as change in size and degree of contrast material enhancement. In the past few years, however, a number of advanced MR imaging techniques have been developed that provide new methods for the assessment of brain tumors. One of these techniques is diffusion tensor imaging. (*Provenzale et al., 2006*)

Diffusion tensor imaging (DTI) is a relatively new MR imaging technique that provides information on the microstructural organization of white matter in vivo and is a promising tool for the reliable preoperative assessment of the major white matter tracts in patients with brain tumors(*Ulmer et al., 2004*). With DTI, the preferential diffusion of water molecules in the direction parallel to the orientation of white matter fibers makes it possible to visualize fiber tracts in 3D, by choosing seed and target regions of interest on the path of the fibers.(*Mori et al., 2002*).Until now, these regions of interest have almost exclusively been chosen on the basis of anatomic landmarks by using a DTI-based white matter atlas (*Holodny et al., 2005*). Diffusion-tensor imaging has shown applicability for a number of disease states owing to the fact that normal brain white matter is highly structured, and fiber tracts impart a strong orientational bias toward microscopic water diffusion. The tendency for water molecules to diffuse in some directions rather than equally in all directions is termed "anisotropy.". All types of white matter typically

show greater degrees of anisotropy than are seen in gray matter structures, which have a low degree of anisotropy (*Kealey et al.,2004*).

Although routine structural MR images can accurately demonstrate brain tumors, they do not give precise information about the involvement and integrity of the white matter tracts in the immediate region surrounding tumors. Diffusion-tensor imaging may help in detection of white matter abnormalities in patients with malignant tumors in areas that appear normal on T2-weighted MR images, which raises the possibility that disruption of white matter tracts by tumor infiltration may be detectable by using diffusion-tensor imaging (*Provenzale et al.,2006*) used an anisotropy index similar to fractional anisotropy to show areas of possible white matter disruption in normal appearing white matter in a majority of patients with high-grade glioma, which was not seen in patients with metastatic disease or low-grade glioma.

In one case, an area of white matter abnormality detected only with diffusion-tensor imaging converted to an area of contrast enhancement and hyperintensity on T2-weighted images 2 years after being detected. In another study (*Provenzale et al.,2004*).There was significant decreases in fractional anisotropy in normal-appearing white matter near gliomas, compared with normal values in normal-appearing white matter adjacent to meningiomas .