Biopsy of brain stem gliomas: Changing trends?

Brain stem gliomas have been recognized as a group of heterogeneous tumors with a varying biological behavior and differing potential of growth. The diffuse, non-enhancing pontine gliomas in children demonstrate a uniform, rapidly progressive course, and are usually fatal within a year or two, even with treatment.[1] At the other end of the spectrum, most of the focal upper mid brain and tectal tumors have a very slow growth with a non-progressive indolent course. Similarly cervicomedullary gliomas have also been found to have a slow growth and often have a favorable survival rate, with surgical excision.

In brain stem lesions, the role of surgical excision has been considerably limited due to the associated morbidity and mortality. However, a more aggressive approach toward excision of focal brain stem lesions has been favored in recent years considering that the slow growth of some of the tumors often justify the associated risks and postoperativemorbidity.[2]

The role of the frame-based stereotactic biopsy in brain stem lesions has been well-documented in literature. Conventionally, a transfrontal approach has been used by most authors, although transcerebellar biopsy has also been practiced. As the author mentions, a laterally placed lesion in the cerebellar peduncle is better reached by a transcerebellar approach than a transfrontal approach.[3] Additionally a twist drill craniostomy is sufficient enough to reach the target and a burr hole possibly does not add any advantage, except for obviating injury to a surface vessel. In our practice we routinely obtain a computed tomography (CT) scan few hours after the biopsy, to exclude any asymptomatic hematoma.

Several initial reports quoted a relatively high complication rate of brain stem biopsy, of around 9%, which ultimately led others to question its usefulness in the management of lesions where a diagnosis could be ascertained by radiological measures.[1] Furthermore, considering the fact that a biopsy of one region may not be representative of the overall pathology, its efficacy was questioned. Moreover, the studies did not demonstrate that the modifications in therapy based on the biopsy results contributed to an improved outcome.

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Contrary to the initial reports, a review of the current literature on stereotactic biopsy of the brain stem lesions indicates that the procedure has not been found to be associated with considerable increased risk, while achieving a satisfactory diagnostic yield. In a meta-analysis of 293 brain stem biopsies in both adults and children, transient and permanent neurological deficits were reported in 4 and 1%, respectively, while 0.3% mortality was reported.[4] A diagnostic yield of 94% was reported after the first biopsy, even as it increased to 96% after the second biopsy. In another reported study of 142 patients, a diagnostic efficacy of 93% was achieved, while 9.8% had definitive complications, and one mortality was reported.[5]

Several studies have attempted to correlate the magnetic resonance imaging (MRI) characteristics with the histological diagnosis in brain stem lesions. Dellaretti *et al*. correlated the MRI characteristics with histological diagnosis in adult brain stem lesions and reported a correlation between focal lesions and non-tumorous pathologies. Among the enhancing focal lesions, a diffuse brain stem glioma was found only in one-third of the cases, while it increased to 67%, with enhancing diffuse lesions.[6] In developing countries, where chronic inflammatory lesions like tuberculosis and cysticercosis are more prevalent, a high suspicion for nonmalignant lesions in atypical clinical or radiological presentations is worth considering.[7]

The initial concept of biopsying the diffuse pontine lesions before instituting radiography and chemotherapy fell out of favor among pediatric neurosurgeons in the early 1990s. The relatively indistinguishable MRI features of a diffuse intrinsic non-enhancing pontine lesion, in a child with a rapid onset of cranial neuropathies and long tract signs, were invariably found to be malignant brain stem gliomas and were sufficient to be considered for adjuvant therapy, without a tissue diagnosis.[1]

However, one has to be very cautious about interpreting the recommendations, as it is only applicable to children with diffuse non-enhancing intrinsic lesions in the MRI. It is highly recommended that patients who do not satisfy all the above criteria get a biopsy done, for identification of the lesion.

In recent years, there has been a trend toward reconsidering stereotactic biopsies for children with MRI characteristics of diffuse non-enhancing lesions in the brain stem suggestive of a diffuse intrinsic pontine glioma.[8-10] Recent studies have shown that molecular biology like 1p19q loss and, O6-methylguanin-DNA-methyltransferase (MGMT) status is often correlated with the outcome and response to newer chemotherapeutic agents. Also, in future, tumor genetic profiles are expected to play a role in treating these tumors. These would require tissue sampling with a biopsy and molecular analysis, with the aim of finding a solution for future generations. This often puts the treating neurosurgeon in a difficult situation to decide whether to do biopsy or not. The moral and ethical reasons for biopsying these tumors, with an aim of helping understand the molecular genetics of these tumors for future generations, have to be carefully weighed against the existing suffering of the child with a malignant brain stem glioma and the family, with further aggravation of this suffering with a biopsy procedure.

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