Stereotactic biopsy of brainstem lesions: A 'golden standard' for establishing the diagnosis

The role of stereotactic biopsy in the treatment of brainstem lesions has been a matter of debate since the technique was first described by Gleason and colleagues in 1978.[1] High rates of procedure-related morbidity and mortality in historical studies had raised concerns that risks associated with surgery may outweigh the benefits of establishing a histological diagnosis. Noninvasive diagnostic tools such as magnetic resonance imaging (MRI) had been considered sufficient to determine a diagnosis and guide further treatment.[2] Several studies on this topic have been published recently and their results should prompt us to reevaluate the role of stereotactic biopsy in the treatment of brainstem lesions. MRI has been shown to have a limited accuracy in establishing a diagnosis with false rates of up to 30% and moreover, tumor gradation was false in more than 50% of cases when compared to results of histopathological examination.[3]

The current study by Manoj *et al*.,[4] adds to the growing body of evidence that stereotactic biopsy of brainstem lesions is a safe procedure with a high diagnostic yield. This is well-corresponding with findings of a recent meta-analysis by Kickingereder *et al*., on 1,480 patients who underwent stereotactic biopsy of brainstem lesions.[5] In regard to procedure-related risks and diagnostic yield, the results of stereotactic biopsy of brainstem lesions are comparable to those of supratentorial lesions.[6] What consequences should be drawn by the available literature and the results of the present study? In the management of brain tumors, establishment of a histological diagnosis is crucial for various treatment options such as radiation therapy or chemotherapy.[7] In brain tumors not amenable to surgical resection, stereotactic biopsy is the procedure of choice to establish a diagnosis and in light of available studies demonstrating similar rates of periprocedural risks, this applies to both: Supratentorial tumors and lesions located in the brainstem. Children with brainstem lesions highly suggestive of diffuse pontine glioma in MRI represent an exception as there is consensus that initiation of therapy may be carried out without histopathological confirmation.[8] In recent years, the molecular characterization of metabolic pathways of brain tumors has significantly increased the understanding of the disease behavior.[9] Whether these findings will translate into tomorrow's treatment modalities for respective patients is currently subject to clinical trials. Nevertheless, histological analyses and molecular fingerprinting are needed for an 'individualized' therapy of patients and this underscores the future potential of stereotactic biopsy as a powerful tool in the treatment of this disease.

The technique of stereotactic brainstem biopsy is challenging as sophisticated intraoperative assessment and trajectory planning have to be carried out in order to identify critical steps and avoid complications. For example, the decision to use either a precoronary or transcerebellar entry point has to be tailored patient-specific and appropriate experience is therefore most important. Diagnostic success rates have shown to be positively correlated with the number of biopsy procedures performed each year in a center.[5] All study results which demonstrated low procedure-related morbidity and high diagnostic yield were reported by experienced centers. The present study by Manoj *et al*.,[4] is no exception with the results being derived from the database of a large tertiary neurosurgical referral center with high numbers of patients. A further interesting aspect of the study is that procedures were performed in local anesthesia in a procedure room through twist drill craniostomy. This approach may have beneficial aspects in regard to economic expenses and furthermore, it may represent an option in multimorbid patients with a high anesthetic risk. Nevertheless, those aspects must not hide the fact that the procedure of stereotactic brain stem biopsy belongs in well-experienced hands at large centers with appropriate experience. Then it is a very safe procedure with a high diagnostic yield and should be

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considered the 'golden standard' for the establishment of a diagnosis in patients with brainstem lesions.

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