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# An Overview on Stereotactic Biopsy: A Diagnostic Procedure

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## Description

The diagnosis of brainstem and deep brain lesions is still complicated. Neuroimaging techniques such as Computed Tomography (CT), Magnetic Resonance Imaging (MRI) enhanced scan, and Positron Emission Tomography (PET)-CT/MRI have provided multiple levels of information about anatomy, metabolism, and neurological function, allowing most common intracranial diseases to be diagnosed effectively using neuroimaging and clinical diagnosis. However, the consistency rate between clinical, imaging, and pathological diagnoses in the diagnosis of atypical, small, multiple, diffuse lesions in the brain is not high, and experts compared the diagnostic consistency of brainstem lesions between MRI imaging and pathological findings after stereotactic biopsy and found that the difference rate between the two diagnoses was as high as 30.4%.

The consistency rate between MRI diagnosis and pathological diagnosis in non-enhancing cerebral lesions is only 26.1 to 48.9%. These findings imply that imaging-based identification of cerebral lesions may result in a high rate of misdiagnosis, emphasising the importance of obtaining a histological diagnosis. Craniotomy, neuronavigation, neuroendoscopy, and stereotactic biopsy are among techniques for biopsying intracranial lesions. The histological diagnosis of cerebral lesions can be obtained by image-guided stereotactic brain biopsy, which is a highly accurate and less invasive approach. For finding lesions in the brain, the CT/MRI-guided stereotactic brain biopsy has an error of 0.7 mm. Gessler has shown that stereotactic brain biopsy can yield tumour molecular markers with the same precision as open craniotomy.

Currently, most stereotactic biopsies are conducted on lesions that are relatively massive or have relatively clear images. Stereotactic biopsies for atypical lesions, minor lesions, or lesions in the brainstem and the deep brain's most critical functional area are uncommonly studied. In our hospital, we performed CT-MRI-guided stereotactic brain biopsy for 72 cases of intracranial lesions in the deep brain and brainstem from December 2011 to January 2018. The objective of this study was to compile our findings from these 72 instances and explain technical considerations and tactics for stereotactic brain biopsy.

Stereotactic biopsies for brainstem and deep brain lesions are uncommon.

This paper discusses our 6 years experience in accurately diagnosing lesions in the brain stem and deep brain, as well as technical notes and techniques. Between December 2011 and January 2018, 72 cases of intracranial lesions in the brainstem or deep in the lobes that were subjected to stereotactic biopsy were reviewed retrospectively. Based on the location of the lesion and the picture features, a unique puncture path was created. Deep in the lobes (43 cases, 59.7%) were the most common biopsy targets, including the frontal lobe (33 cases, 45.8%), temporal lobe (4 cases, 5.6%), parietal lobe (3 cases, 4.2%), and occipital lobe (3 cases, 4.2%) (3 cases, 4.2%). The brainstem was involved in 12 instances (16.7%), including 8 cases (11.1%) of the midbrain and 4 cases (5.6%) of the pons or brachium pontis.

Internal capsule (2 cases, 2.8%), thalamus (3 cases, 4.2%), and basal ganglia were among the other targets (12 cases, 16.7%). One patient experienced immediate intracerebral haemorrhage in the biopsy area two hours after surgery, and another experienced delayed intracerebral haemorrhage seven days later. After surgery, the remaining patients did well. There was no mortality as a result of the surgery. The advantages of CT-MRI guided stereotactic biopsy of lesions in the brainstem or deep in the brain include great safety, accurate diagnosis, and low complication rates. It's vital for unusual, microscopic, diffuse, numerous, and refractory lesions to be diagnosed. For CT-MRI fusion positioning, Image Fusion and Omni Sight Excel series software (Integra Radionics, Inc., USA) were utilised.

The target and incision were set, and the coordinate values were recorded. The personalised puncture path was developed using the following standard biopsy concepts, based on the target position and imaging characteristics:

- Brainstem target lesions: the traditional ipsilateral frontal lobe technique was used for lesions in the midbrain and upper pons. The incision is normally made 1-2 cm below the coronal suture, 3-4 cm alongside the midline, and follows the principle of parallel brainstem long axis. We used a contralateral, transfrontal, extraventricular approach for the lower and lateral pons lesions, with a biopsy path through the internal capsule, thalamus, midbrain, pons, and other structures, avoiding cerebellar canopy occlusion and entering the target lesions in the lower part of the pons and the brachium pontis.
- The ipsilateral frontal lobe technique was used to treat the target lesion in the internal capsule, thalamus, basal ganglia, and frontal lobe. The entrance point was 2-3 cm from the midline and in front of the coronal suture;
- The ipsilateral parietal nodule approach was frequently used for deep target lesions in the parietal lobe, occipital lobe, and temporal lobe. The point of entry was around 2-3 cm from the midline.

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