Diagnostic yield of stereotactic biopsy

A retrospective analysis was performed on 50 consecutive patients who underwent stereotactic biopsy in the Department of Neurosurgery, Sarawak General Hospital from 2014 to 2019. Variables including age, gender, lesion topography and characteristics, biopsy methods, and surgeon's experience were analyzed along with diagnostic rate. This study included 31 male and 19 female patients with a mean age of 48.4 (range: 1-76). Of these, 25 underwent frameless brain-suite stereotactic biopsies, 15 were frameless Portable Brain-lab® stereotactic biopsies and 10 were frame-based CRW® stereotactic biopsies. There was no statistical difference between the diagnostic yield of the three methods. The diagnostic yield in our series was 76%. Age, gender, and biopsy methods had no impact on diagnostic yield. Periventricular and pineal lesion biopsies were significantly associated with negative diagnostic yield ($p = 0.01$) whereas larger lesions were significantly associated with a positive yield ($p = 0.01$) with the mean volume of lesions in the positive yield group (13.6 cc) being higher than the negative yield group (7 cc). The diagnostic yields seen between senior and junior neurosurgeons in the biopsy procedure were 95% and 63%, respectively ($p = 0.02$). Anatomical location of the lesion, volume of the lesion, and experience of the surgeon have significant impacts on the diagnostic yield in stereotactic brain biopsy. There was no statistical difference between the diagnostic yield of the three methods, age, gender, and depth of lesion [1)].

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retrospectively analyzed all consecutive MRI-guided frame-based stereotactic biopsies for which an intraoperative histological smear was carried out, performed over 29 months from January 2017 to May 2019 at the Pitié-Salpêtrière University Hospital (Paris, France).

Results: 145 stereotactic biopsies for which an intraoperative histological smear was carried out were performed in 145 adult patients. Mean age at biopsy was 52.4 ± 12.2 years. Histological diagnoses encountered in this series were: primary or secondary cerebral neoplasm (90.3%), inflammatory diseases (4.8%) and infectious diseases (4.8%). All biopsies were contributory to diagnosis. The negative biopsy rate was therefore significantly lower in the patient group for which an intraoperative histological smear was carried out than in our historical control group (0% versus 2.6%, $p = 0.04$).

Conclusion: Considering the diagnostic yield benefit contributed by the intraoperative histological smear, we advocate for its routine use during brain stereotactic biopsies [2)].

Dammers et al. reported on a single centre results regarding the diagnostic yield of stereotactic needle biopsies of brain lesions. The yield then (1996-2006) was 89.4%. In the present study, we review and evaluate our experience with intraoperative frozen-section histopathologic diagnosis on-demand in order to improve the diagnostic yield.

One hundred sixty-four consecutive frameless biopsy procedures in 160 patients (group 1, 2006-2010) were compared with the historic control group (group 2, n = 164 frameless biopsy procedures). Diagnostic yield, as well as demographics, morbidity and mortality, was compared. Statistical analysis was performed by Student's t, Mann-Whitney U, Chi-square test and backward logistic regression when appropriate.

Demographics were comparable. In group 1, a non-diagnostic tissue specimen was obtained in 1.8%, compared to 11.0% in group 2 ($p = 0.001$). Also, both the operating time and the number of biopsies

needed were decreased significantly. Procedure-related mortality decreased from 3.7% to 0.6% (p = 0.121). Multivariate analysis only proved operating time (odds ratio (OR), 1.012; 95% confidence interval (CI), 1.000-1.025; p = 0.043), a right-sided lesion (OR, 3.183; 95% CI, 1.217-8.322; p = 0.018) and on-demand intraoperative histology (OR, 0.175; 95% CI, 0.050-0.618; p = 0.007) important factors predicting non-diagnostic biopsies.

The importance of a reliable pathological diagnosis as obtained by biopsy must not be underestimated. We believe that when performing stereotactic biopsy for intracranial lesions, next to minimising morbidity, one should strive for as high a positive yield as possible. In the present single centre retrospective series, we have shown that using a standardised procedure and careful on-demand intraoperative frozen-section analysis can improve the diagnostic yield of stereotactic brain biopsy procedures as compared to a historical series [3)].

Jain et al. examined the reliability of histological diagnosis achieved vis a vis the number of biopsy bits obtained along a single trajectory of the stereotactic needle. A retrospective analysis of stereotactic biopsies performed in a single tertiary care neurosciences center, during a period of 11 years, between 1995 to 2005 was done. The overall diagnostic accuracy achieved on histopathology was correlated with the number of bits obtained by stereotactic biopsy. A total of 86 cases were analyzed, which consisted of 58 males and 28 females. Age ranged from 6 to 75 years, with a mean age of 36.1 years. Twenty percent of the patients were in the pediatric age group and 15% were > or =60 years of age. Most common sites biopsied were thalamus/basal ganglia (55.8%), followed by eloquent areas and other sites. A definitive histological diagnosis was established in 70 cases (diagnostic yield, 81.3%), which encompassed 65 neoplastic and 5 nonneoplastic lesions. Astrocytic lesions, the most common, include 10 pilocytic astrocytomas (PA), 29 diffuse astrocytomas (DA), 11 anaplastic astrocytomas (AA), and 7 glioblastoma multiforme (Glioblastoma). In 16 cases no definite histological diagnosis could be offered. The number of biopsies ranged between 1 and 6 bits (mean, 2; median, 1). The majority (68.7%) of the biopsies were 1 or 2-bits. The diagnostic accuracy increased from 76.5% for single biopsies to 84% and 88.2% for 2 and 3 bits, respectively, and 100% for biopsies with 5 to 6 bits. Overall, a trend of higher diagnostic yield was seen in cases with more biopsies when compared with single bit biopsies. Thus, this small series confirms that stereotactic procedures involving multiple bits are associated with a high diagnostic yield [4)].

The aim of a retrospective study was to investigate the diagnostic yield and accuracy of stereotactic biopsy in patients harboring brain mass. Stereotactic biopsy was performed in 130 patients between 1995 and 2000 in an educational and research hospital in Turkey. The results of histological analysis were compared to the resected specimens in 23 patients. The lesions were lobar in 62% of cases and deep-seated in 38% of cases. During the biopsy procedures, the pathologist was in the operating theatre and a very small fragment was used for cytological examination. No frozen section was used in any of the cases. Samples were diagnostic in 122 cases. The overall diagnostic yield of the procedure was 94%. A definitive histological diagnosis was not made in eight patients. The histological diagnoses of the two procedures were identical (complete agreement) in 16 cases. In three cases, the histological diagnoses between the two procedures were slightly different without impact on patient care (minor disagreement). The diagnosis of the stereotactic biopsy was completely changed after craniotomy in four cases (major disagreement). The accuracy of the histological diagnosis was 83%. There was only one major complication, which involved intracerebral hemorrhage. Despite the limited number of patients who underwent resection, our data suggest that stereotactic

biopsy of brain masses is a safe and accurate technique that can obtain adequate tissue for histological diagnosis, thus providing the best avaible treatment for patients. Cytological evaluation of the streotactic biopsy also is a highly effective tool for obtaining sufficient material during the procedure in many cases [5)].

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