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Brain Needle Biopsy

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Though the advance in neuroradiological technique have provided a sensitive tools for early detection of intracranial lesions, histological diagnosis is still necessary for definitive and proper management.

Needle biopsy of the brain utilizing computerized tomography (CT) scan data was performed in 41 patients at Songklanagarind Hospital during April 1987 to March 1995. The size of lesion ranged from 20 mm to 90 mm. There was 88 per cent accuracy in histologic diagnosis. In the nondiagnostic group, the lesions were at brain stem in four and cerebellar in one. Tabulation of complication revealed no incidence of scalp or bone infection, 3 per cent incidence of insignificant postoperative bleeding and one patient developed postoperative hemorrhage leading to coma and died at 1 month later. We concluded that: where stereotactic surgery is not available, the freehand technique assisted by CT scan, data can be an extremely useful for performing biopsies of many brain lesions.

Key words: *Brain biopsy, computerized tomography*

Computerized tomographic (CT) scan have allowed us in earlier diagnosis and more precise localisation of intracranial lesions. Many techniques of needle biopsy assisted by CT scan have been applied to the brain.[1-8] One of the advanced technique is CT or MRI - compatible stereotactic system.[9,10] However, in many instances, biopsy can be performed safely and accurately without a stereotactic device.[1-8]

We described our technique in obtaining diagnostic brain tissue without any elaborate equipment or sophisticated calculations. The safety and accuracy were also reported.

MATERIALS AND METHODS

Between April 1987 to March 1995, needle brain biopsy was performed in 41 patients. Operative procedure was divided into two groups depending upon the size of abnormal lesion detected by CT scan (Figure 1). In the first 2 years, scheme II was done only in small or brainstem lesions. After the mortality case of postopera-

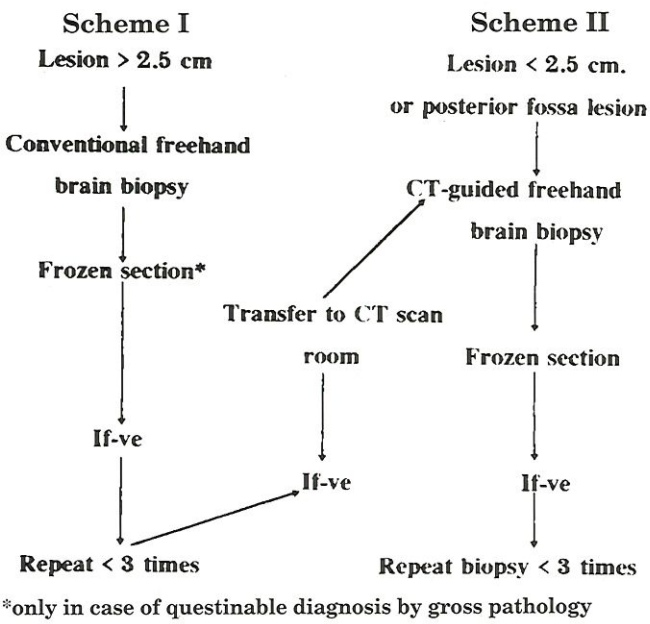

Fig. 1 Flowchart outlining Schemes of management by needle brain biopsy.

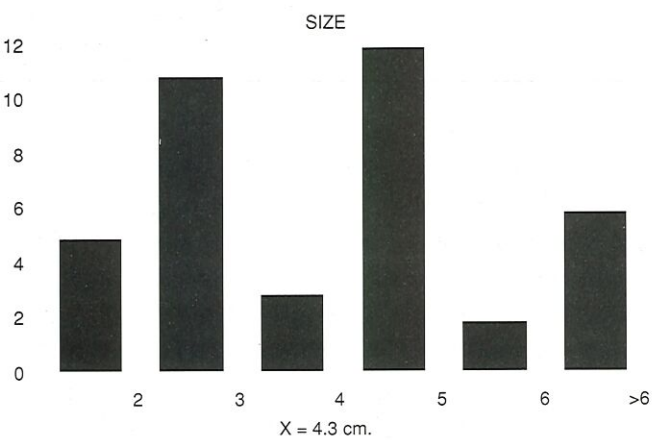

Fig. 2 Graph showing size of patient's brain lesions.

tive cerebellar hematoma, all posterior fossa lesions were included in the Shceme II. Due to high risk of vascular injury, lesions at pineal, suprasellar and sellar regions were excluded from this study. In case of multiple lesions, the biopsy was performed at the largest lesion. The burr-hole site is selected to avoid the crucial areas of the brain, for example, the motor strip. If possible, the site is placed behind the hairline to give the best cosmetic result.

A 13 gauge Cone biopsy needle was placed through the burr hole. In Scheme I, the distance from skull to middle part of lesion was measured preoperatively. In case of Scheme II; CT-guide technique, interval CT-scans are made to confirm the position of the needle tip relative to the lesion. When the needle tip is against the lesion, the stylet is removed and the needle is advanced. Suction is applied with a syrings attached to the needle and the tissue is sent for frozen section. In Scheme I, for shortening the operating time, as the obtained tissue is grossly pathologic, the tissue is sent only for permanent section. If bleeding occurred through the guide needle, the guide should be left in place until it stops. Postoperative CT-scan is done only in case of deterioration of consciousness or worsening of neurological deficit. The procedure is considered failure when permanent pathological diagnosis reveals normal brain tissue.

RESULTS

There were 24 males and 17 females. The age ranged from 5 months to 77 years (mean 38 years). Other general profiles of the patients were shown in Tables 1, 2. There was one postoperative bleeding leading to coma and she died one month later by sepsis. There was no morbidity by our procedure. One small intralesion hematoma was incidentally found by pre - radiation therapy CT scan. Definite diagnosis by histology can be made in 37 cases (88%). In the nondiagnostic group, the lesions were at brainstem in four and cerebellar in one.

Two cases of cerebellar tumour were performed under Scheme I of which one case died without definite pathological diagnosis. Only one case from Scheme I was switched Scheme II and the final diagnostic tissue was obtained.

DISCUSSION

Needle brain biopsy appeared to have its greatest application in patients with suspected tumours, either inaccessible to removal by standard neurosurgical procedure or when bulk removal would likely be of little significant therapeutic benefit or result in neurological deterioration.

In 1977, Maroon et al. reported the success of CT-assisted freehand brain biopsy.[4] Many techniques in obtaining a good result of brain biopsy have been described in the literatures.[1-8]

Table 1 General Profile of 41 Patients.

Age	5 mos - 77 yrs. (mean = 38)	
Sex	F = 24:17	
Location	- Brainstem	6 cases
	- Cerebellum	6 cases
	- Parietal	6 cases
	- Frontal	4 cases
	- Frontoparietal	4 cases
	- Multiple	4 cases
	- Corpus callosum	3 cases
	- Bilat. parietotemporal	2 cases
	- Basal ganglia	1 case
	- Intraventricular	1 case
	- Hemisphere	1 case
	- Thalamus	1 case
	- Third ventricle	1 case
	- Parietotemporal	1 case

Table 2 Pathological Diagnosis of Patients.

- GBM	6 cases
- Malig. Astrocytoma	1 case
- Astrocytoma gr. 3	3 cases
- Astrocytoma gr. 2	4 cases
- Astrocytoma gr. 1	5 cases
- Astrocytoma (recurrent)	1 case
- Mixed glioma	1 case
- Ependymoma	1 case
- Malignant ependymoma	1 case
- Medulloblastoma	4 cases
- Lymphoma	2 cases
- Encephalitis	2 cases
- Abscess	1 case
- Tuberculoma	1 case
- Neuroblastoma	1 case
- Meningitis	1 case
- Hematoma	1 case
- Normal	5 cases

***GBM = Glioblastoma Multiforme.**

In this study, the large and supratentorial lesions are subjected for freehand biopsy. For small or infratentorial lesions, CT-guided freehand biopsy is very helpful in reaching the target with minimal trauma to surrounding structures.

Goldstein et al. pointed that in cases where biopsy could be safely performed using either technique, free-hand CT-guided biopsy should be used because it is more economical than sterotactics.[1] Wen et al. concluded that freehand CT-guided biopsy was as safe as stereotactic biopsy in obtaining diagnostic tissue from superficial brain lesions.[7] The result of our procedure showed its safety, accuracy and the successful rate which is the same as other reports. (Table 3). If we excluded the biopsy of brainstem, the diagnostic surccess will be 97 per cent. Despite the lack of operating room sterility in our freehand CT-guided biopsies, proper adherence to sterile technique can prevent the surgical infection in our series. Our technique is also more economical because we reduced the utility of CT scan either during or after biopsy. We recommended routine post biopsy CT scan only in case of posterior fossa lesions because clinical sign in these cases is not reliable enough for early detection of postoperative hematoma.

Diagnostic success with any needle biopsy technique is dependent upon several factors. Accurate tissue targeting to prevent sampling error is vital. The experience of the surgeon is also important in obtaining the diagnostic tissue and avoidance of postoperative morbidity. The ability of the neuropathologist to make a definite diagnosis on a small sample is also essential. However, small fragments may not represent the whole neoplam and decrease the reliability of the pathological diagnosis. Cappabianca et al. be-

Table 3 Results of Previous CT-Guided Freehand Biopsy Series.

Series (Ref. No.)	No. of Patients	Mortality (%)	Morbidity (%)	Diagnostic Success (%)
Greenblatt et al, 1982	26	3.8	8	79
Moran et al, 1984	185	0.5	2	97
Goldstein et al, 1987	64	4.7	14	92
Wen et al, 1993	69	1.1	7	91
Ratanalert et al, 1995 (present data)	41	2.4	-	88

lieved that the reliability of pathological diagnosis from needle biopsy depends on the tumours type: for isomorphic neoplasms, tumors with pathognomonic characters or malignant tumors, diagnoses made on small fragments can be considered representative of the whole lesion; for pleomorphic tumors (that is, those of glial origin) diagnoses on small fragments should be carefully weighed, because although clear features of malignancy may be considered representative of the whole neoplasm, a diagnosis of low-grade glioma must remain doubtful as features of greater aggressiveness may be present in areas not reached by the biopsy needle.[11]

It should be emphasized that this study is not intended to against the utility of advanced technology. The applicability of MRI or CT-assisted stereotaxis procedures have their place in the treatment of CNS disease. However, in this era of medical cost-benefit concerning, it is not of a good reason for disregarding a simple and effective method of freehand brain biopsy in selected cases.

SUMMARY

Our present policy, combinding traditional freehand and CT-guided freehand brain biopsy provided a reasonably reliable, economical and safe technique for making tissue diagnosis of many brain lesions. This technique will be most useful in center where investment in CT - stereotactic - frame is not warranted, because of economic concerns.

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