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CRUSH PREPARATION CYTOLOGIC FINDINGS OF CNS TUMORS: A STUDY OF 199 CASES

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ABSTRACT

Crush preparation cytology technique was used during the operative procedure for the diagnosis of 199 CNS tumors. This technique is simple, easy to perform, rapid, and inexpensive. The cytomorphologic findings were excellent and helped achieve a rapid and correct diagnosis. This technique was used on the tiny, small specimens which were not suitable for frozen sectioning. The results were compared with biopsy reports. The overall diagnostic accuracy by this technique was about 97.7%.
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INTRODUCTION

Very often the biopsy specimens of CNS tumors sent for frozen section are small in size. In such situations frozen sectioning is difficult and a good amount of tissue is lost during the process in the cryostat. Moreover, cutting artifacts are frequently seen in frozen sections and create diagnostic problems.

Due to the above, Adams et al.[1] suggested crush preparation cytology technique for the diagnosis of CNS tumors during the operative procedure. Later on, very few papers were published in the literature describing the efficacy of this technique.[2-4,9]

This paper describes the cytomorphologic features of a large series of CNS tumors and emphasizes the importance of the crush preparation cytology technique.

MATERIALS AND METHODS

During the period between 1987-1996, in Shiraz University hospitals, 199 cases of CNS tumors were diagnosed by crush preparation cytology technique in the operating room as an alternative procedure for frozen section. The ages ranged from 5-72 yrs and 122 were male and 77 female.

The biopsy specimens were cut into small pieces of 1 mm thickness which were then crushed and smeared between two slides; one was fixed in 75% ethanol for a few minutes and the other was air-dried immediately. The fixed slide was

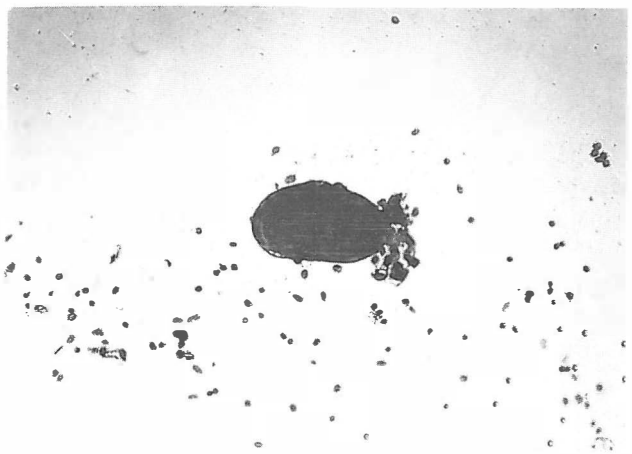

Fig. 1. Meningioma showing whorl formation. Papanicolaou × 1200.

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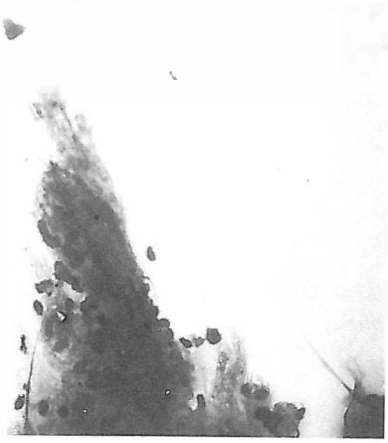

Fig. 2. Schwannoma showing flame-shaped structure reminiscent of Antoni-A region. Wright-Giemsa × 600.

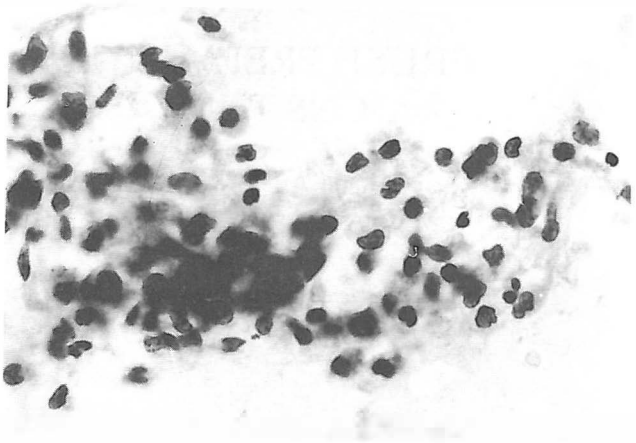

Fig. 3. High-grade astrocytoma showing pleomorphic cells, resembling metastatic tumor. Papanicolaou × 1200.

stained by the Papanicolaou method and the air-dried slide was stained by the Wright-Giemsa method.

RESULTS

The smears of all cases yielded good cellularity, and cytomorphologic features were well preserved. 40 cases were diagnosed as meningiomas (Fig. 1), 27 cases as schwannomas (Fig. 2), 34 cases as low grade astrocytomas, 28 čases as high grade astrocytomas (Fig. 3), 8 cases as oligodendrogliomas (Fig. 4), 15 cases as ependymomas (Fig. 5), 12 cases as medulloblastomas, 1 case as choroid plexus papilloma (Fig. 6), 14 cases as pituitary adenomas (Fig. 7), 15 cases as metastatic tumors, 2 cases as dermoid cysts and 3 cases as chordomas.

The comparison of cytologic and histologic diagnoses are shown in Table I.

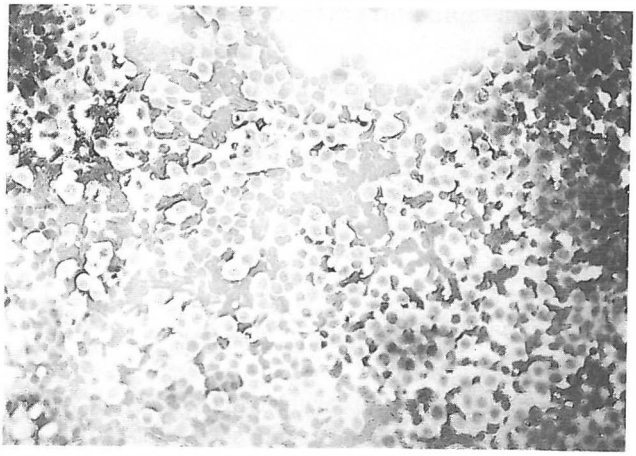

Fig. 4. Oligodendroglioma showing uniform cells with clear cytoplasm (fried-eggs). Initially misdiagnosed as medulloblastoma. Papanicolaou × 1200.

DISCUSSION

The cytologic findings of various types of CNS tumors have been infrequently described in a few papers.[2-9] In our cytologic study, the characteristic cytomorphologic findings of CNS tumors were observed. The possible differential diagnoses and the pit-falls of cytology smears are discussed below.

The smears of meningiomas, schwannomas, low grade astrocytomas, ependymomas, medulloblastomas, metastatic tumors and chordomas yielded high cellularity. The cytologic findings were very characteristic, and we were able to reach the correct diagnosis. The meningiomas revealed whorly formations with psammoma bodies, schwannomas revealed

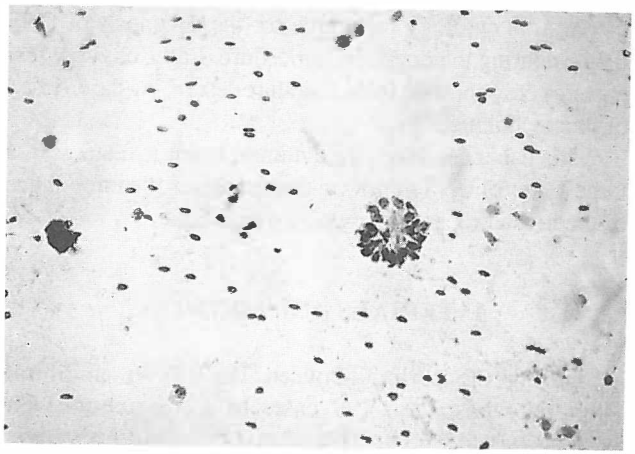

Fig. 5. Ependymoma showing round cells with pseudorosettes. Papanicolaou × 600.

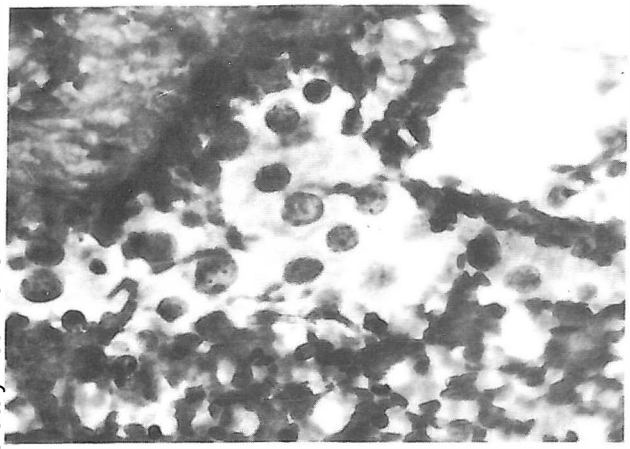

Fig. 6. Choroid plexus papilloma showing small papillary clusters, confused with metastatic adenocarcinoma. Papanicolaou × 1200

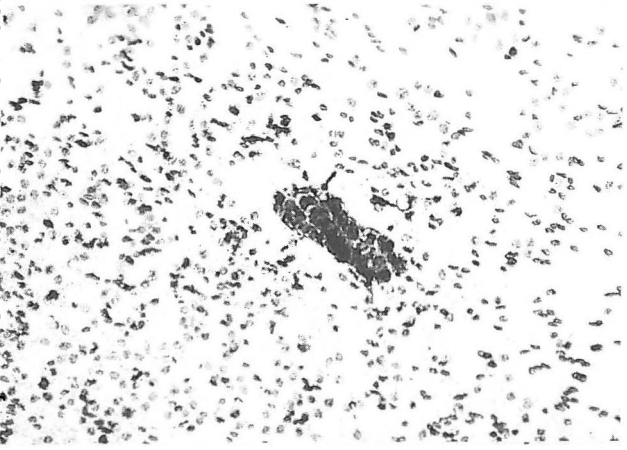

Fig. 7. Pituitary adenoma showing uniform round cells with abundant basophilic cytoplasm mimicking a meningioma. Papanicolaou × 1200.

biphasic cell populations (spindle and round cells), ependymomas revealed glial and epithelial components with rosette formations, and medulloblastomas revealed a good number of Homer-Wright rosettes and rarely calcification. Low grade astrocytomas showed uniform round cells with neuropil material, chordomas revealed numerous lakes of pink myxomatous material and metastatic tumors revealed numerous groups of pleomorphic cells and rare glandular structures.

A few cases of high grade astrocytomas were misdiagnosed as metastatic tumors, probably due to the presence of extensive necrosis and the absence of neuropil. In such situations immunocytochemistry and more clinical information will help achieve a correct diagnosis. Oligodendrogliomas were rarely diagnosed as medulloblastomas due to the presence of calcification. In such cases we advise thorough screening in order to identify Homer-Wright rosettes. Whenever papillary structures are seen in crush preparations, we recommend that choroid

Table I. Comparison of histologic and cytologic diagnoses of 199 cases of CNS tumors

No. of cases	Cytologic diagnosis	Histologic diagnosis
3	Chordoma	Chordoma
39	Meningioma	Meningioma
27	Schwannoma	Schwannoma
34	Astrocytoma (low-grade)	Astrocytoma (low-grade)
28	Astrocytoma (high-grade)	Astrocytoma (high-grade)
2	Metastatic tumor	Astrocytoma (high-grade)
8	Oligodendroglioma	Oligodendroglioma
2	Medulloblastoma	Oligodendroglioma
15	Ependymoma	Ependymoma
10	Medulloblastoma	Medulloblastoma
1	Choroid plexus papilloma	Choroid plexus papilloma
2	Metastatic adenocarcinoma	Choroid plexus papilloma
14	Pituitary adenoma	Pituitary adenoma
1	Meningioma	Pituitary adenoma
10	Metastatic tumor	Metastatic tumor
2	Dermoid cyst	Craniopharyngioma
1	Metastatic tumor	Craniopharyngioma

plexus papilloma and well differentiated metastatic adenocarcinoma be considered in the diagnosis. Again we emphasize the relevance of clinical information; multiplicity of the tumor and location of the lesion can help to differentiate the above two conditions. The presence of calcification can be noticed in meningiomas, oligodendrogliomas, medulloblastomas and prolactinomas. So in these situations we should search for specific cytologic findings.

In this study three cases of craniopharyngiomas were incorrectly diagnosed as dermoid cysts (2 cases) and metastatic tumor (one case). The cases diagnosed as dermoid cysts showed only anucleated squamous and no other cells. The case diagnosed as metastatic tumor showed only epithelial islands with no other components. Probably inadequate biopsy material is responsible for the incorrect diagnosis of these cases. Clinical information at the time of screening may be helpful for correct diagnosis of such cases.

In conclusion, the crush preparation cytology technique is a simple and inexpensive procedure. It is useful for intraoperative diagnosis of CNS tumors. This technique can be used as a substitute for frozen sectioning, and the diagnostic accuracy by this method is about 97.7%.

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