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DIAGNOSTIC ACCURACY OF INTRAOPERATIVE FROZEN SECTIONS IN HISTOPATHOLOGICAL LESIONS AT A TERTIARY CARE CENTRE, AHMEDABAD, INDIA

Pathology

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ABSTRACT

BACKGROUND AND AIMS: Intraoperative consultation of histopathological lesions provides accurate diagnosis to surgeons. In this study accuracy of intraoperative consultations of histopathological lesions and discrepancies in diagnosis were analyzed.

METHODS: All cases from January, 2017 to August, 2019 in which intraoperative frozen section had been performed, and which reported in the Section of Histopathology, Civil Hospital Ahmedabad were retrieved. The diagnoses given on frozen were compared with the final diagnosis given on permanent paraffin sections.

RESULTS: During the study period, 166 cases were received for intraoperative consultation. Out of these 166 cases, 146(88%) cases were concordant, 20 cases (12%) were discrepant. The diagnostic accuracy of frozen section was 88%. Out of these 166 cases, 20 cases (12%) show discrepancies.

CONCLUSIONS: Our results show a reasonably high percentage of accuracy in the intraoperative diagnosis of histopathological lesions.

KEYWORDS

Frozen section, histopathological lesions.

INTRODUCTION:

The rapid diagnostic evaluation at frozen section may guide intraoperative management, which may be particularly important during operation.[1,2] In addition, frozen section allows for the appropriate triage of tissue for ancillary studies such as electron microscopy, microbiologic

cultures, and frozen tissue storage.[1,2,3,4] The major criteria for requesting an intraoperative diagnosis vary but the major criteria include the following: (i) if intraoperative management will be influenced by the diagnosis (ii) if an unexpected lesion is seen at surgery which is different from what was suspected clinically (iii) if the main aim is to obtain a biopsy diagnosis (iv) to assess margins if radical excision is planned [4,5,6] In some centers, pathologists only employ cytology smears prepared by the "squash method", while in others both cytology and frozen section are employed[12.] The generally soft consistency of most primary neoplasms facilitates the preparation of smears, and smear cytology has been used with great success for the intraoperative diagnosis of neoplasms[6,7,8,9,10,11], especially astrocytomas, oligodendrogliomas, small round cell tumors etc [12]. Frozen sections are mainly useful for the more firm, rubbery neoplasms such as meningiomas, ependymomas, and most metastatic tumors in which it is difficult to prepare good cytology smears. [5,7,10]

Studies have shown that a combination of the two techniques is most beneficial[14.] In our center also, we use a combination of both techniques whenever we get an intraoperative consultation in a suspected case of neoplasm. The diagnostic accuracy of intraoperative consultations has ranged between 85% and 90% in various studies [1,3,4,6,12,15]

The aim of this study was:

(a) To analyze the accuracy of intraoperative consultations of lesions in our practice
(b) To assess the discrepancies in our cases.

Materials and Methods:

All cases from January, 2017 to August, 2019 in which intraoperative frozen section had been performed, and which were reported in the Section of Histopathology, Civil hospital, Ahmedabad, India were retrieved. The diagnoses given on frozen section were compared with the final diagnosis given on permanent sections (and additional material if received), as indicated on the frozen section and final pathology report.

Results:

During the study period, 166 cases were received for intraoperative consultation (frozen section). In all cases, cryostat sections (FS) plus cytology smears were prepared. The ages of the patients ranged from 1 month to 78 years. 82 were males and 84 were females. Our results showed a reasonably high percentage of accuracy. Out of these 166 cases, 146(88%) cases were concordant, 20 cases (12%) were discrepant. The diagnostic accuracy was 88 %.

Discussion:

The accuracy of our FS diagnoses, as shown by the concordance rate of 88% compares favorably with internationally published data[1,3,4,6,12,15] In our cases, the reason for seeking intraoperative consultation was primary diagnosis. All types of primary neoplasms including astrocytomas (including pilocytic astrocytoma and glioblastoma multiforme, ependymomas, oligodendrogliomas, meningiomas, medulloblastomas, metastatic carcinomas etc), fibroadenoma, phyllodes, and benign ovarian cyst were diagnosed. In some cases, a diagnosis of high grade glioma was given. Non-neoplastic diagnoses such as reactive gliosis, granulomatous inflammation including fungus, were also given. 20 discrepant cases in our current series of 166 cases: 5(25%) of 20 discrepancies involved errors in classification of spindle cell lesions, most commonly confusing schwannomas with fibroblastic meningiomas. 9(45%) cases involved errors in differentiating astrocyomas from medulloblastomas, oligodendrogliomas and ependymoma. 2(10%) cases involved errors in differentiating reactive from neoplastic processes, most frequently gliosis versus glioma. 4(20%) discrepancies involved errors in the grading of tumors.

Table:1 Histological diagnosis of Frozen section in our study

Diagnosis	No. of cases	Percentage (%)
Astrocytoma grade II	27	16.27
Meningioma	26	15.67
Glioblastoma multiforme	23	13.86
Schwannoma	11	6.63
Medulloblastoma	11	6.63
Pilocytic astrocytoma	10	6.02
Pituitary adenoma	8	4.82
Oligodendroglioma	8	4.82
Metastatic carcinoma	7	4.22
Ependymoma	7	4.22
Ductal cancer	3	1.82
Tuberculosis	3	1.82
Gliosis	2	1.20
Epidermoid cyst	2	1.20
Pleomorphic sarcoma	1	0.60

Fibro-osseous lesion	1	0.60
Hemangioma	I	0.60
Central neurocytoma	1	0.60
HCC	1	0.60
Melanoma	1	0.60
Phyllodes	1	0.60
Craniopharyngioma	1	0.60
Hemangiopericytoma	1	0.60
NF	1	0.60
Benign ovarian cyst	1	0.60
Signet ring adenocarcinoma	1	0.60
Fibroadenoma	1	0.60
Follicular thyroid neoplasm	1	0.60
NHL	1	0.60
Malignant PNET	1	0.60
Anaplastic Astrocytoma	1	0.60
Anaplastic oligodendroglioma	1	0.60
Total	166	100

Table:2 Histological discrepant cases in our study

Frozen diagnosis	Final Diagnosis	No. of cases
Meningioma	Schwannoma	1
Schwannoma	Meningioma	2
High grade glioma	Ependymoma	1
Astrocytoma Grade II	Oligodendroglioma	2
Medulloblastoma	Oligodendroglioma	1
Gliosis	High grade glioma	2
High grade glioma	Low grade glioma	1
Glioma	Hemangioblastoma	1
Glioblastoma	Anaplastic Astrocytoma	2
Oligodendroglioma	Ependymoma	1
Schwannoma	Neurofibroma	2
Pilocytic Astrocytoma	Ependymoma	1
Medulloblastoma	Ependymoma	3

Spindle Cell Lesions:

Distinguishing meningiomas, peripheral nerve sheath tumors, and other spindled cell proliferations can be challenging at FS, particularly with limited submitted tissue or tissue distorted by crush artifact or cautery. Both meningiomas and schwannomas commonly arise in the cerebellopontine angle region and can show a predominantly benign, spindled cell appearance, thick-walled vessels, abundant collagen, and perivascular whorling. Although degenerative atypia ("ancient" change) is classically characteristic of schwannomas, meningiomas can demonstrate prominent nuclear pleomorphism at times. In addition, some meningiomas lack whorling, psammoma bodies, or cytoplasmic protrusions [16] features that are typically used in making the diagnosis.

Astrocytoma v/s Oligodendroglioma v/s medulloblastomas v/s ependymoma:

Distinguishing astrocytoma from Oligodendroglioma intraoperatively is difficult because of the degree of overlap of nuclear and cytoplasmic features. In one instance, a high grade (grade III) astrocytoma was reported as medulloblastoma. A diagnosis of "glioma" along with indication of the differential diagnosis and some indication of grade is usually adequate at FS. There are some differences regarding grading thresholds between the 2 glioma types that might present a challenge if one is not sure of the tumor lineage. In most instances, stratification into "low grade" (WHO grade II) versus "high grade" (WHO III or IV) is sufficient at FS. Histologically, oligodendrogliomas tend to be more cellular and less pleomorphic than astrocytomas. Oligodendroglial tumor nuclei appear round and uniformly hyperchromatic; however, freezing tissue often produces irregularities in the nuclear contours of an Oligodendroglioma, making it look similar to an astrocytoma.[16] Medulloblatoma show sheets of cells, sometimes with rosettes or nodular areas of more differentiated cells which might get misdiagnosed as ependymoma.[17]

Reactive From Neoplastic:

Distinguishing between reactive astrocytosis (gliosis) and a low-grade glial neoplasm is one of the most difficult differential diagnostic challenges in surgical neuropathology. It is common to find at least some degree of gliosis adjacent to and associated with a tumor. Microscopically, the hypercellularity observed in gliosis, because of reactive astrocytes, tends to be evenly distributed, whereas the distribution of neoplastic cells is uneven in tumors. The nuclei of reactive astrocytes are slightly enlarged and eccentrically positioned within abundant, eosinophilic cytoplasm with stellate processes. A low nuclear-cytoplasmic ratio is maintained. Occasional binucleate cells can be encountered. In contrast, many tumor cells found in low grade fibrillary astrocytomas have increased nuclear-cytoplasmic ratios with little discernible cytoplasm. Astrocytoma nuclei have markedly irregular contours with hyperchromasia and unevenly distributed chromatin.

Tumor over grading:

Frozen section can introduce changes that are not typically seen in paraffin-embedded, permanent sections, making it difficult to accurately assess cellularity and pleomorphism. The most important differentiating features at FS in distinguishing a high-grade glioma from a low-grade glioma are the presence of mitotic figures (especially atypical), tumor cell necrosis, and vascular proliferation.

Breast lesions:

Breast carcinoma is the second most common malignant tumor among rural Indian women after carcinoma cervix, whereas in urban Indian women, breast carcinoma overcomes the incidence of carcinoma cervix.[18] In our study, a total of 5 cases were studied including 3 benign and 2 malignant breast lesions as diagnosed on paraffin embedded, H & E sections. There are 3 cases of ductal carcinoma, single cases of phyllodes and fibroadenoma.

Conclusion:

Our results show a reasonably high percentage of accuracy in the intraoperative diagnosis of lesions. However, there are limitations and some lesions pose a diagnostic challenge. Hence, there is a need to improve our own diagnostic skills and establish better communication with neurosurgeons.

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