ORIGINAL RESEARCH PAPER

Pathology

KEY WORDS: Intra operative,Scrape/Imprint cytology,Histopathology.

ROLE OF SCRAPE CYTOLOGY IN THE INTRAOPERATIVE DIAGNOSIS OF TUMOUR

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ABSTRACT

Background: Intra operative pathological assessment has offered a very valuable service in patient management. The present study was done to evaluate the status of intraoperative cytology as a diagnostic and supportive investigation for various tumours. **Aim and objectives:** To evaluate the utility of imprint /scrape cytology for the rapid diagnosis of surgically removed specimens. **Materials and Methods:** 70 surgically removed specimens from various organs and systems were studied. Smears were taken from each specimen before formalin fixation and stained by modified rapid H&E and Papanicolaou staining. Cytological diagnosis was made and then results were compared with the histological diagnosis taking the latter as the gold standard. **Results:** Out of the 70 cases sampled, 70 were satisfactory for evaluation. Overall accuracy rate was 87.14 % .Six cases of false positive diagnosis and 3 false negative diagnosis were made .Positive predictive value was 75% and negative predictive value was 93.47%. **Conclusions:** Imprint /scrape cytology is a good complement for the rapid diagnosis in histopathological study of tumor/tumor like lesions and intra operative cytology can be used an adjunct to frozen section.

INTRODUCTION

Intraoperative pathological assessment is frequently requested to establish the nature, lesion, grade of a neoplasm or to determine the adequacy of margins/biopsy material[1]. Surgeons particularly want to know whether a lesion is malignant or not. Both Frozen Section (FS) and Touch Impression Cytology (TIC) serve this purpose well. Both provide accurate results in minutes while the patient is under anesthesia. Surgeon then modifies his surgical plan based on the Intraoperative Consultation from Pathologist. While FS tissue architecture closely approximates permanent histology sections, enabling a degree of comfort, TIC provides better and crisp cellular details and even some tissue architecture. However there is still some reluctance on part of some pathologists most likely due to their inadequate experience to render a definite diagnosis on TIC alone.[2] Pre-operative evaluation by sonography and CT-scan do not always predict the exact nature of the ovarian lesions. The fine needle aspiration diagnosis is difficult to establish because of the difficulty in procedure due to its location . Sonographic guided FNA can be done, but the fear of spillage and the seeding of the tumour cells withdraws the pathologists to perform the risky procedure. But intraoperative pathological diagnosis is very helpful and guides the surgeon to plan the extent of surgery and for further management of the patient. Till date, frozen section and intraoperative cytology are the methods used for intraoperative pathological diagnosis.[3] Frozen section is the most widely used technique with an accuracy of 86–97% . But the disadvantages are, it is an expensive and complex process, possibility of tissue loss, difficulty in recognition of borderline tumours and to distinguish between primary and metastatic ovarian tumours.[3] The advantages of scrape cytology procedure are, it is simple, inexpensive and rapid, and there is no tissue loss, well preserved cellular details. This procedure takes about 10 minutes. It helps the surgeons by providing the provisional diagnosis and the extent of surgery can be planned quickly.[2] The present study was done to evaluate the status of intraoperative cytology as a diagnostic and supportive investigation of various lesions.

MATERIALS AND METHODS

The study included 70 surgically removed specimens from various sites of body of patients admitted in KIMS, Hubballi with clinical suspicion of malignancy during a period of 1 year from December 2020 to December 2021. Immediate Gross examination of the specimen of tumour removed from the patient was done by inspection and palpation. The specimen was then cut with a sharp knife into two halves. The cut surface was wiped off the excess blood, if present, with the help of a filter paper. The most appropriate area thought to be representative of lesion was chosen. Depending on the consistency of the lesion, touch, scrape or crush techniques were used to prepare cytological smears. Imprint smears are made from soft/fleshy lesions. The crush/Squash smears technique was used for lesions that were friable or necrotic, are made by crushing a small fragment of representative tumor tissue between two glass slides and then smearing it. Scrape smears from dense/sclerotic lesions .The area was scraped with a sharp scalpel or the end of a glass slide. On an average, five labeled smears per case were taken from different representative areas. The slides were immediately put into 95% ethyl alcohol and stained with modified rapid H&E staining.Total time taken for smear preparation, staining and reporting was about 10 minutes. All the cytological findings were analysed and evaluated independently. The macroscopic examination of the tumours and cytological impression was immediately conveyed to the surgeons to reduce the time interval and operative delay. Rest specimens were sent for histopathological study. Histopathological impressions were also recorded. The data obtained was entered in Microsoft excel sheet and analysed using SPSS. Descriptive statistics were computed and presented as frequencies.

RESULTS

The study included 70 surgically removed specimens from various sites of body such as genitourinary tract, thyroid, gastrointestinal tract and lymphnodes.

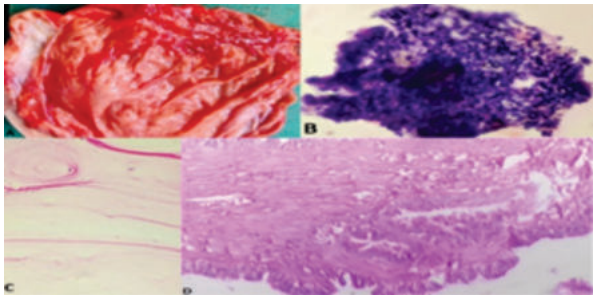

Fig.1: Serous Cystadenoma. A: Gross picture showing the

smooth inner wall. B: Monolayer and 2D cellular aggregate. Cells with uniform size and shape. Oval bland nuclei with regular chromatin and small, fine nucleoli, scant cytoplasm. Preservation of polarity and cohesiveness (H&E400x). C:Smear showing a Serous fluid background (H&E,200x) . D: Section studied shows cyst wall lined by columnar non ciliated epithelium (H&E400x).

Figure 2: Low grade sarcoma uterus.A:Gross picture showing polypoidal uterine mass invoving myometrium. B:Smear showing pleomorphic cells with nuclear atypia and prominent nucleoli.(H&E 400X)

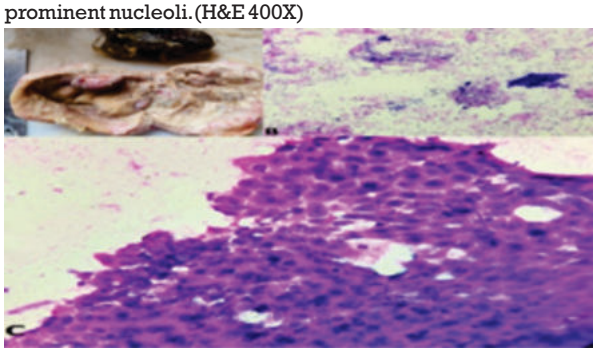

Fig.3. A. Teratoma, Gross image showing cystic structure filled with fat, hairfollicle and necrotic material. B. Smear showing adipocytes in a neroric background. C .Smear studied shows round to polygonal cells arranged in a sheet.These cells are having keratinized cytoplasm with high nuclocytoplasmic ratio.Nuclei are hyperchromatic and some of them are having prominent nucleoli.(H&E,400X)

Table I: System/Organ wise distribution of cases and Results of 70 surgical specimens

System	Non neoplastic	Cytology results			No of histologically accurate cases
		Benign	Borderline	Malignant	
Genitourinary		41	09	13	54
Thyroid		01		01	02
CNS				01	01
Lymphoid	02				02
Digestive system		01			01
Salivary gland				01	01
Total	02	44	09	16	59

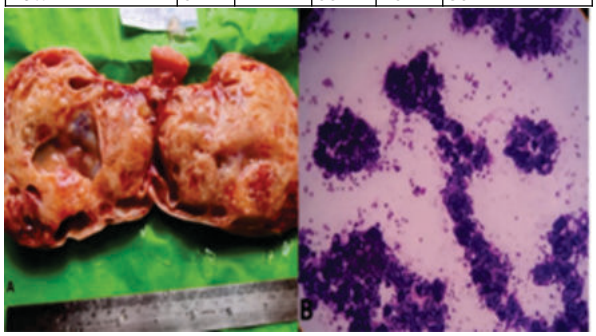

Fig.4. A.Gross image of serous cystadenocarcinoma showing solid and cystic with honeycomb like areas. B.Smear studied are cellular ,cells are arranged in cords and glandular architecture(H & E 100X).

Table II: Organ wise distribution of cases correctly diagnosed

Organs/Systems	No.of Cases	Correctly diagnosed	Percentage
Genitourinary	63	54	85.71
Thyroid	02	02	100
CNS	01	01	100
Lymphoid	02	02	100
Digestive system	01	01	100
Salivary gland	01	01	100
Total	70	61	87.14

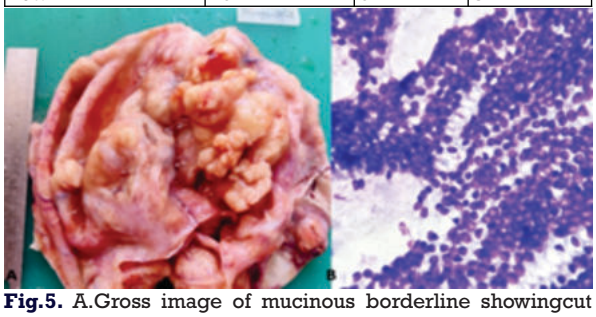

Fig.5. A.Gross image of mucinous borderline showingcut section of cyst with multiple nodules with congested blood vessels.B. Smear studied are cellular showing tall, columnar cells in sheets having basally located nuclei with apical mucin filled vacuoles.(H&E 400X)

Table III :Histological classification of ovarian tumor

Origin of tumour	Type of tumour	No.of scrape cytology cases	No.of histopathology cases
Serous	Benign	24	24
	Borderline	02	02
	Malignant	03	03
Mucinous	Benign	09	11
	Borderline	07	04
	Malignant	02	03
Germ cell tumour	Teratoma,mature	01	01
	Teratoma with carcinoma	01	01
Sex cord stromal tumour	Fibroma and thecoma	01	01
	Adult granulosa cell tumour	02	02

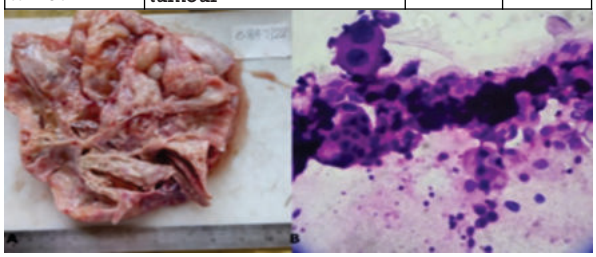

Fig.6. Gross image showing mucinous cystadenocarcinoma, multiloculated cyst with solid areas . B .Smear studied shows cells with high N:C ratio with scant amount of mucinous cytoplasm(H &E 400X)

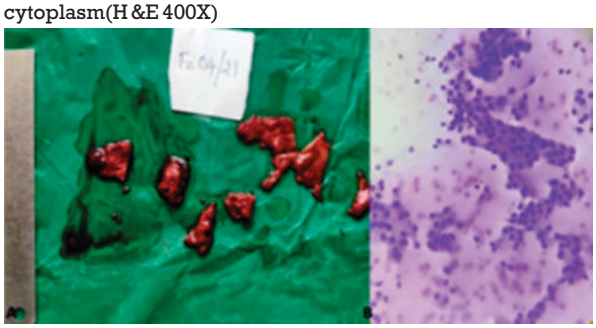

Fig.7. Nodular Goitre with Hyperplasia ,A. Multiple tissue bits of thyroid tissue B.Smear studied are cellular showing thyroid follicular cells arranged in sheets and cords in a colloid background.

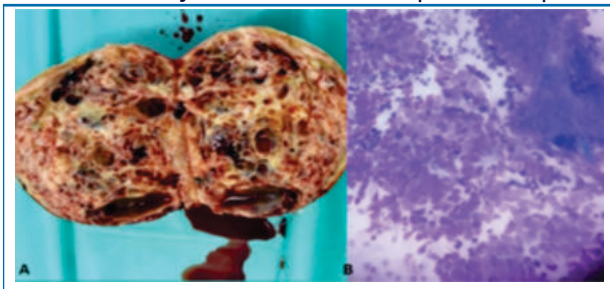

Fig.8. Adult Granulosa cell tumour A. Gross picture showing solid ,multiple cystic areas filled with mucoid fluid ,areas of haemorrhage .B.Smear studied shows overlapping cell clusters and some tumor cells surrounding eosinophilic hyaline globules resembling call-Exner bodies. Occasional large tumor cells with fine vacuolated cytoplasm and high nuclear: cytoplasmic ratio. The nuclei were central, round to oval with fine, evenly distributed chromatin with and nuclear grooves(MGG, 400X).

DISCUSSION

History of scrape/imprint cytology can be traced back to 1927 when Leonard S. Dudgeon and Vincent Patrick at the University of London raised the horizons of the rapid cytological diagnosis of freshly cut specimens with reliable accuracy rates.[1]

Intraoperative cytology has high accuracy rates, excellent preservation of cellular details, and the possibility of identifying focal, macroscopically undetectable neoplastic lesion in large tissue fragments. The method is simple and inexpensive, not requiring special technique or instrument. At the centers where the facilities of frozen section are not available, intraoperative scrape cytology is a useful tool for intraoperative diagnosis of tumor.[6]

Ovarian neoplasms are a heterogeneous group of benign and malignant tumors of epithelial, stromal and germ cell origin. Most ovarian tumors cannot be easily distinguished from one another on the basis of their clinical or gross characteristics alone. Therefore, cytological interpretation of ovarian neoplasms is both interesting and challenging . Fine-needle aspiration cytology in the preoperative investigation of the ovarian tumor has been discouraged since the puncture of a cystic carcinoma might cause intraperitoneal seeding. The intraoperative pathological consultation is indispensable in determining malignancy, and surgical staging and management for ovarian tumors because of the difficulty of their preoperative or pathological examination. Frozen sections are the gold standard for the intraoperative diagnosis of malignant tumors, but they seem unsuitable for ovarian tumors that are large in size and have various pathological patterns.[4]

There are several advantages of IOC over frozen sections which have been attested by different authors . They are: (1) rapidity of preparation which is not at the expense of accuracy; (2) simple and inexpensive method; (3) excellent preservation of cellular details without freezing artifacts; (4) no loss of tissue as with the cryostat; (5) possibility of identifying focal, macroscopically undetectable neoplastic lesions in large tissue fragments; (6) possibility of examining adipose, necrotic and calcified tissue; (7) diagnosis of malignancy when the tissue is limited in quality, and (8) avoidance of contamination and safe handling.[4]

There were limitations of IOC in the diagnosis of tumors with low malignant potential and in mucinous tumors, which require histological and adequate histological sampling . Among the several cytological techniques applied to ovarian specimens, scrape cytology is often considered the most suitable . In developing countries like ours, where frozen sections are not always an option, cytology can reliably and independently be used as a method for intraoperative evaluation.[4]

Epithelial borderline tumors were difficult to distinguish from both benign and malignant epithelial tumors due to overlapping cytological features. In the absence of complex branching, nuclear pleomorphism and hyperchromasia, the overall morphology of cells closely resembled that of benign serous tumor.[4]

FNAC of thyroid gives valuable information about the nature of the lesion and most patients can be managed adequately on an optimal FNAC diagnosis [8]. However, some lesions may not be diagnosed on FNAC. To bridge the gap between the non-diagnostic FNAC's and final histopathological diagnosis; many techniques have been employed to give additional information that helps in better management decisions. Intraoperative consultation is of importance in such cases.[17]

Smear cytology is of great importance in the intraoperative diagnosis of CNS pathology. However, it is important to know the age, clinical details of patient, duration and type of symptoms, whether onset was sudden or insidious, radiological findings, and site of tumor before evaluating the smear intraoperatively.[18]

FNAC is a simple, quick and reliable technique for evaluating suspicious salivary gland lesions. Cytology can distinguish nonneoplastic from neoplastic and benign from malignant lesions. Identifying malignancy preoperatively helps in planning an appropriate surgical procedure for the patient. The high accuracy, sensitivity and specificity of FNAC make it an excellent first-line investigation for the evaluation of various salivary gland lesions.[19]

In our study, sensitivity, specificity, positive predictive value and negative predictive value were 85.7%, 87.75%, 75 %, 93.47 % respectively.The overall accuracy was 87.14%.

Shidham et al.[12] and Khunamornpong et al.[13]observed that scraping of tumor is the method preferred because large number of cells can be obtained and cells can be spread well on the slides. According to Esteban et al.[14] touch preparation yields less cellular smears than scrape smears.Kolte and satarkar[6] also found that smears prepared after scraping of tumor yielded uniformly cellular smears.

Scucchi et al[15] compared 2,250 intraoperative cytology with frozen section with the final diagnosis achieved on paraffin sections.10 in 18 cases the diagnosis were deferred until the paraffin section at the time of Intraoperative consultations. The diagnostic accuracy in distinguishing benign from malignant lesions by combined intraoperative cytology and frozen section was 99.2%. The accuracy rate is higher than reported in large series based on frozen section alone. Sensitivity and specificity were respectively 98.2% and 100%. The diagnostic accuracy of each technique alone was 94.9%. For frozen section the sensitivity was 89.9% and specificity 97.9% as compared to the touch cytology, which had a sensitivity of 94.9%, and specificity of 96.8%.[16.]

Table IV: Comparison with other studies

Author	No of cases	% of accurate cases
K. C. Suen et.al	1258	98.3
Sherley et.al	120	92.2
Badami Harnish et.al	119	92.63
Jayashreee Geothe1	130	96.15
Dudgeon, et al7	200	95.5
Pickren, et al.8	1819	97.4
Mavec9	100	93.0
Tribe10	510	96.9
Suen, et al.11	108	96.3
Shidham, et al.12	249	98.4

Kolte and satarkar6	75	97.3
Present study	70	87.14

The comparison of imprint/ squash cytology with final histopathology diagnosis indicates that imprint/ squash smears are equally good in diagnosing malignancies of serous, mucinous tumours of ovary. Overall, through this study, it was identified that the imprint cytology is a cost effective, easy, rapid and consistent method for diagnosis of various ovarian neoplasms.[5]

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