

Comparative Diagnostic Accuracy of Frozen Sections and Scrape Cytology in Ovarian Neoplasms

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ABSTRACT

Introduction: Frozen section is a well-established method for providing rapid and accurate intraoperative diagnosis. Cytological techniques such as imprint and scrape cytology and intraoperative fine-needle aspiration cytology are conventionally considered as less accurate alternatives to the frozen section. However, inexperienced hands, scrape cytology has been shown to provide remarkably accurate results comparable to the frozen section. **Aims:** The aims of this study are as follows: (1) To evaluate the diagnostic utility of scrape cytology in the intraoperative diagnosis of ovarian neoplasms. (2) To compare the accuracy of scrape cytology with frozen section in the intraoperative diagnosis of ovarian neoplasms. **Materials and Methods:** This study was conducted over a period of 3 years from 2014 to 2017. A total of 60 cases of clinically and radiologically suspected ovarian masses were included in the study. Thirty cases were evaluated using frozen section and 30 cases using scrape cytology alone. The intraoperative diagnosis of both was compared with the final paraffin section histopathology. **Results:** The diagnostic accuracy of scrape cytology and frozen section in determining a benign and malignant nature of neoplasm was 96% and 100%, respectively. In 93% of cases, scrape cytology enabled correct categorization of the tumor as surface epithelial, germ-cell tumor, sex cord-stromal, or others. **Conclusion:** Scrape cytology is an adjunct to frozen section for providing an intraoperative diagnosis; however, in resource-poor settings, it can be used as a stand-alone method for aiding intraoperative decision-making.

KEYWORDS: Frozen sections, intraoperative diagnosis, ovarian neoplasms, scrape cytology

INTRODUCTION

Intraoperative pathology consultation is often required for guiding immediate surgical decisions such as to limit the extent of surgery, to perform radical surgery, or to terminate the surgery altogether. Frozen sections, first performed by Dr. Louis B. Wilson in 1905 at the request of the surgeon Dr. Mayo, have now become the cornerstone and the preferred method for providing rapid and accurate intraoperative diagnosis.^[1] Over the years, the frozen section has provided fairly accurate results.^[2] However, with the requirement of a cryostat, and skill in cutting fresh frozen sections, it is yet to find a place in small, resource-poor centers. These limitations can be overcome with the use of rapid,

inexpensive, and simple cytological procedures such as scrape cytology. Scrape cytology was introduced for the intraoperative diagnosis much later in 1927,^[3] yet, some studies have shown that with expertise it can give highly accurate results.^[4]

However, a comparative diagnostic evaluation is needed to establish the utility of scrape cytology vis-a-vis frozen sections.

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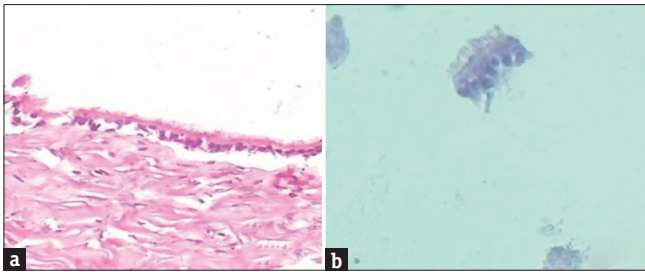


Figure 1: Comparative scrape cytology and frozen section figures: (a) Frozen section showing ciliated columnar epithelium of serous cystadenoma, (H and E, ×20). (b) ciliated columnar lining suggestive of serous cystadenoma on scrape cytology, (toluidine blue, ×40)

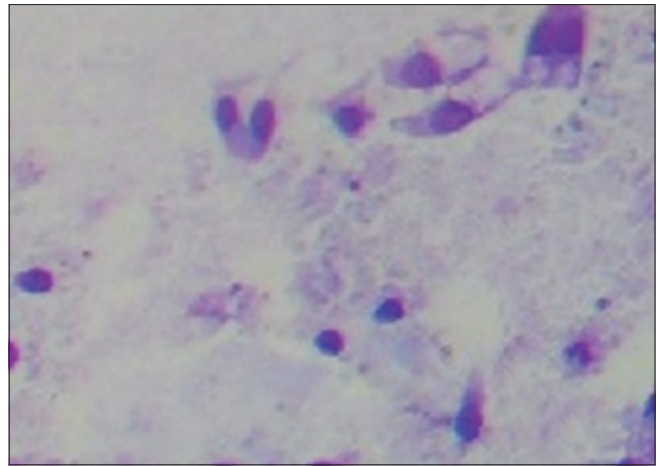


Figure 2: Scrape cytology smear showing benign looking columnar cells with apical mucin suggestive of mucinous cystadenoma, (toluidine blue, ×40)

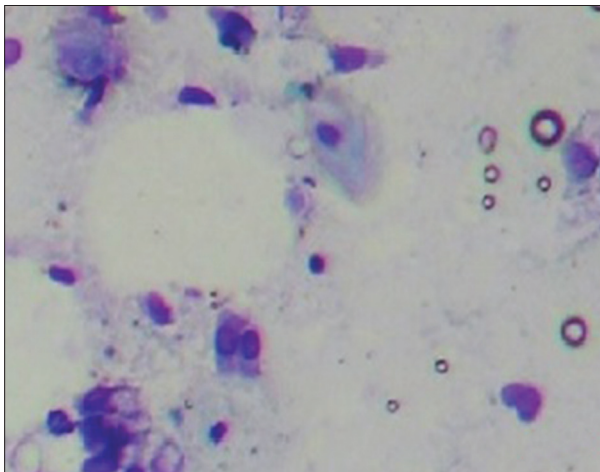


Figure 3: Smears showing benign ciliated cells, mucinous cells, and squamous cells suggestive of mature cystic teratoma, scrape cytology, (toluidine blue, ×40)

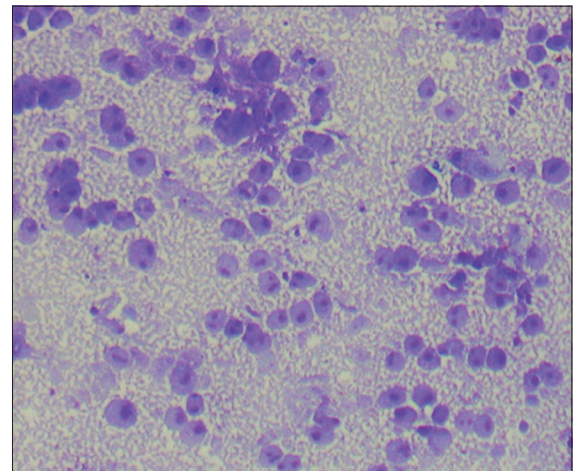


Figure 4: Toluidine blue-stained scrape cytology smear showing dysgerminoma cells with abundant cytoplasm, against a tigroid background, (×20)

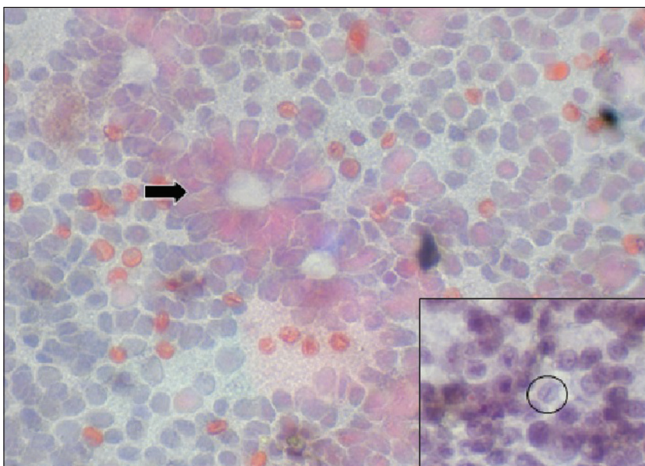


Figure 5: Scrape smear showing rosette-like Call-Exner bodies (black arrow), (×20). The inset shows longitudinal nuclear groove giving a coffee-bean appearance, (Pap stain, ×20)

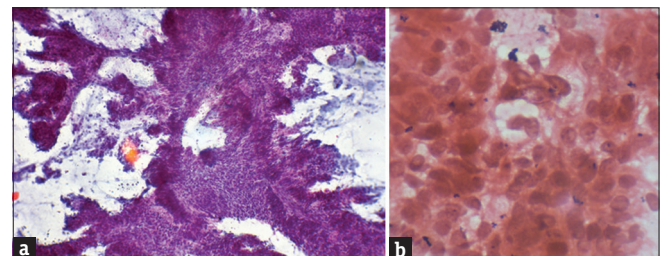


Figure 6: (a) Low-power view showing extensively branched papillaroid, overlapping cell clusters, (Pap stain × 10). (b) High-power view showing hyperchromatic nuclei, with vacuolated cytoplasm and high pleomorphism, (Pap stain, ×20)

Aims

The aims of this study are as follows:

1. To evaluate the diagnostic utility of scrape cytology in the intraoperative diagnosis of ovarian neoplasms

2. To compare the accuracy of scrape cytology with frozen section in the intraoperative diagnosis of ovarian neoplasms.

MATERIALS AND METHODS

This was a retrospective study conducted over a period of 3 years from 2014 to 2017. The data for 60 cases

of ovarian masses sent for intraoperative opinion were retrieved from records. Thirty of these cases had been evaluated with frozen section and scrape cytology, and 30 cases with scrape cytology alone. The final diagnoses provided on paraffin section histopathology were compared retrospectively with the intraoperative diagnosis.

The percentage diagnostic accuracy and positive predictive values of both scrape cytology and frozen section were calculated.

Frozen sections had been performed using the standard cryotome sectioning and staining with rapid H and E, taking about 15–20 min from specimen receiving to reporting. Scrape cytology smears were stained with rapid pap and toluidine blue, taking about 10 min from specimen receiving till reporting.

RESULTS

The overall diagnostic accuracy of scrape cytology in determining benign versus malignant nature of the neoplasm was 96%. Twenty-nine out of 30 cases were correctly placed as benign or malignant. However, one case of immature teratoma was incorrectly diagnosed with a mature cystic teratoma; as the immature elements

were missed on scrape cytology. On the other hand, the frozen section was able to correctly classify the benign or malignant nature of the neoplasms in all 30 cases (100%) [Table 1].

As far as the broad categorization of neoplasms is concerned, correct classification into surface epithelial tumors, germ-cell tumors, sex cord-stromal tumors, and others, could be done by scrape cytology in 28 of 30 cases. Of these two cases, one case of fibrothecoma was incorrectly diagnosed with a germ-cell tumor on scrape cytology. Furthermore, one case of myxoma ovary was incorrectly diagnosed with a teratoma on scrape cytology. Thus, the accuracy in broad classification using scrape cytology was 93%. Using frozen section, the broad categorization of ovarian neoplasms was correct in all 30 cases (100%) [Table 1].

DISCUSSION

The role of scrape cytology has been studied in ovarian neoplasms. Khunamornpong and Siriaunkgul^[5] studied the role of scrape cytology of ovaries in the intraoperative consultation of ovarian lesions and found it to be a useful rapid cytodagnostic tool. However, a comparative analysis of frozen section versus scrape

Table 1: Comparison of diagnosis of frozen section diagnosis and scrape cytology diagnosis with final diagnosis

Final diagnosis	Frozen section diagnosis	Scrape cytology diagnosis
Serous cystadenoma (7)	Serous cystadenoma (2) [Figure 1a]	Serous cystadenoma (3) [Figure 1b] Serous cystadenofibroma (1) Borderline serous cystadenoma (1) Mucinous cystadenoma (1)
Serous cystadenofibroma (3)	Serous cystadenoma (2)	
Serous cystadenoma with sex cord-stromal (fibrothecoma) (1)	Serous cystadenoma with sex cord-stromal tumor, fibroma (1)	
Mucinous cystadenoma (7)	Mucinous cystadenoma (3) Borderline mucinous cystadenoma (2)	Mucinous cystadenoma (2) [Figure 2]
Mucinous cystadenoma with mature cystic teratoma (4)	Mucinous cystadenoma with mature cystic teratoma (1)	Mucinous cystadenoma (1) Mucinous cystadenoma with mature cystic teratoma (2)
Mucinous cystadenocarcinoma (3)	Mucinous cystadenocarcinoma (1) Borderline mucinous (1)	Mucinous cystadenocarcinoma (1) [Figure 6]
Serous cystadenocarcinoma (4)	Serous cystadenocarcinoma (1) Borderline serous, carcinoma cannot be ruled out (1)	Serous cystadenocarcinoma (2)
Mature cystic teratoma (6)	Mature cystic teratoma (3)	Mature cystic teratoma (3) [Figure 3]
Immature teratoma (1)		Mature teratoma (1)
Dysgerminoma (4)	Dysgerminoma (2)	Dysgerminoma (2) [Figure 4]
Fibroma (3)	Fibrothecoma (1)	Fibroma (2)
Fibrothecoma (4)	Fibrothecoma (2)	Germ-cell tumor (1) Fibroma (1)
Granulosa cell tumor (4)	Granulosa (2)	Granulosa (2) [Figure 5]
Myxoma (1)		Teratoma (1)
Leiomyosarcoma (1)	Stromal tumor (1)	
Hemorrhagic cyst (3)	Hemorrhagic cyst (1)	Hemorrhagic cyst (2)
Endometriotic cyst (4)	Endometriotic cyst (2)	Endometriotic cyst (1)
Para ovarian cyst (1)		Para ovarian cyst (1)

cytology is needed to conclusively demonstrate the accuracy of scrape cytology.

In this study, we retrospectively compared the diagnosis provided on scrape cytology with those provided by frozen sections. The diagnostic accuracy in determining benign versus malignant nature of the neoplasm by scrape cytology was comparable with that of the frozen section. Thus, it can be used as an alternative intraoperative diagnostic tool in resource-poor settings where facilities of the frozen section are not available.

The advantages of scrape cytology include availability in resource-poor centers, which is the situation in a lot of centers in India. Rapid turnaround time is another advantage of scrape cytology over frozen sections, reducing the diagnosis time by almost half (10 min, vs. 15–20 min for frozen sections). In addition to these two, scrape cytology also offers remarkably accurate diagnoses. With a predictive value of 96% in determining benign versus malignant nature of neoplasms, scrape cytology is an acceptable diagnostic tool for guiding intraoperative decision-making. The accuracy of scrape cytology in broad categorization of ovarian neoplasms was also found to be fairly satisfactory (93%) comparable to the frozen section.

The pitfalls of scrape cytology lie in determining borderline cases. Although the diagnosis is possible in frankly malignant cases, it cannot determine invasion. In this study, one case of immature teratoma was incorrectly diagnosed with a mature cystic teratoma, as the immature element was missed on cytological sampling. Furthermore, a case of fibrothecoma was incorrectly diagnosed with a germ-cell tumor on scrape

cytology. This was due to incorrect interpretation of morphological features. This could also be due to the lack of characteristic morphologic features on the scrape, which can be overcome with greater experience in sampling and scrape preparatory techniques as well as interpretation.

CONCLUSION

The pitfalls and limitations notwithstanding, scrape cytology is still an acceptable, rapid, and fairly accurate alternative in resource-poor centers for guiding intraoperative management. In such settings, the routine use of intraoperative scrape cytology can aid surgical management.

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Conflicts of interest

There are no conflicts of interest.

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