Comparative Study Of Imprint And Scrape Cytology In The Diagnosis Of Tumour And Tumour Like Lesions Of Ovary'

By

DR.AFRA TAQDEES

Dissertation submitted to

In partial fulfillment for the degree of

DOCTOR OF MEDICINE
IN
PATHOLOGY

Under the guidance of

DR. ARAKERI S.U M.D.

PROFESSOR

DEPARTMENT OF PATHOLOGY

BLDE (DEEMED TO BE UNIVERSITY)

SHRI B. M. PATILMEDICAL COLLEGE, HOSPITAL & RESEARCH CENTRE

VIJAYAPUR – 586103

2019

ABSTRACT

Introduction:

Tumour and tumour like lesions of ovary are the most frequently encountered ovarian lesions in females. In the present day, utility of preoperative and intraoperative diagnostic cytology is increasing. Various cytological methods such as Imprint and Scrape cytology can be used for quick microscopic analysis of a pathological lesion and helps to differentiate between neoplastic and non neoplastic conditions.

Objectives:

To evaluate utility of imprint and scrape cytology in tumour and tumour like lesions of ovary.

Materials and Methods:

A prospective study was done on surgically resected specimens of ovary from December, 2017 to June, 2019.

For imprint smears, slides were gently touched on freshly cut surface of specimen. For scrape smears, cut surface of ovary was scraped with one end of the slide and smear was prepared on the other slide. These smears were immediately fixed in 95% ethanol and stained with Haematoxylin & Eosin stain and PAP stain and cytomorphological study of smears was done which was further correlated with histopathology diagnosis.

Results:

Total 110 cases were studied, 68 (61.8%) cases were epithelial tumours, 18(16.4%) cases were germ cell tumours, 12(10.9%) cases were diagnosed as sex cord stromal tumours, 1 case each of lymphoma and metastatic carcinoma (0.9% each) and 10 (9.1%) cases were tumour like lesions of ovary. Cytohistological discordance was found in 17 cases when compared to histopathological diagnosis. Sensitivity, Specificity, Positive predictive value and Accuracy of imprint and scrape

cytology was 88%, 98.7%, 91.6% and 91%respectively. Comparison between imprint and scrape smears was done for cytomorphological features such as cellularity, architectural pattern, nuclear features, cytoplasmic staining and background. Difference between imprint and scrape for cytomorphological features was statistically significant at 5% level of significance.

Conclusion:

Scrape cytology provides an efficient means of investigation and is having a high degree of sensitivity, specificity and accuracy; hence it can be applied for cytomorphological analysis of tumour and tumour like lesions of ovary as a rapid diagnostic modality in adjunct to frozen section.

Key words: Histopathology, Imprint cytology, Scrape cytology, Ovary.

LIST OF ABBREVATIONS USED

FNAC	Fine Needle Aspiration Cytology
WHO	World Health Organization
FIGO	International Federation of Gynecology and Obstetrics
H & E	Haematoxylin & Eosin
PAP	Papanicolaou
NOS	Not otherwise specified
DPX	Dibutylphthalate polystyrene xylene
OG	Orange Green
EA	Eosin Azure
SD	Standard deviation
HS	Highly significant
NS	Not significant
Fig	Figure
Sr No:	Serial Number
Yrs	Years
PPV	Positive predictive value
NPV	Negative predictive value
HPR no.	Histopathology report number

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

INTRODUCTION:

Tumour and tumour like lesions of ovary are the most frequently encountered ovarian lesions in females. These lesions can be diagnosed preoperatively depending upon the clinical presentation of patient and radiological findings, whereas postoperatively diagnosis is made by histopathological study.[1]

In present days, utility of preoperative and intra-operative diagnostic cytology is increasing as the patient concern, management and treatment has become extremely individualized. Variety of cytological techniques that are used for cytological diagnosis are Fine Needle Aspiration Cytology (FNAC), imprint smear cytology, scrape smear cytology etc.[3,8]

FNAC of superficial and deep lesions from various sites is an accepted diagnostic technique. However, its use in lesions of ovary has been limited due to its relative inaccessibility, fear of spill over of tumour contents into peritoneal cavity, secondary implantation or rupture of capsule that can lead to upstaging of tumour.[4]

Ovarian tumours are heterogeneous and are comprised of group of benign, borderline & malignant tumours of epithelial, stromal and germ cell origin. Certain non-neoplastic lesions of ovary can present as a pelvic mass and may mimic ovarian neoplasm. Proper intraoperative recognition of such lesions is important to plan further appropriate therapy.[1,6,12]

Intra-operative cytology or frozen section study can help to differentiate non-neoplastic ovarian lesions from neoplastic lesions. Also it is important to differentiate benign neoplasm from malignant neoplasm for proper planning and further appropriate management of patient.

Imprint and Scrape cytology are simple, rapid and reliable cytological diagnostic modality. In these techniques, cellular yield is more with better preservation of architecture and also different areas can be studied simultaneously by this technique. Imprint and scrape cytology is also advantageous as it is less time consuming, reliable , easy to adopt and does not require specialized equipments or set ups.[2,4,9]

Imprint and Scrape smears can also be used for confirmation of recurrent malignancies and to determine the clearance or involvement of surgical margins and lymph nodes. Material obtained from imprint and scrape smears can also be used for flow cytometry and cytogenetic studies.[3,8]

Some authors in their study mentioned that imprint and scrape cytology is being used by many pathologists for several years along with frozen section for the preoperative diagnosis of lesions in many organs. However its utility in the diagnosis of ovarian tumours is not widely recognized. Also there is very less literature available on comparative study of imprint and scrape cytology.[1,5,11]

Hence, the present study was undertaken to study the cytomorphological features in ovarian tumours and to do a comparative study of imprint and scrape cytology in the diagnosis of tumour and tumour like lesions of ovary.

OBJECTIVES OF THE STUDY

(1) To compare cytomorphological features in imprint and scrape smears of tumour and tumour like lesions of ovary.

(2) To evaluate the utility of imprint and scrape cytology as a diagnostic modality in tumour and tumour like lesions of ovary by comparing with the histopathological diagnosis.

REVIEW OF LITERATURE:

IMPRINT AND SCRAPE CYTOLOGY - A BRIEF HISTORICAL PROSPECTIVE:

History of imprint and scrape technique dates back to 1927. Vincent Patrick and Leonard S. Dudgeon at the London University utilized imprint and scrape cytology technique for rapid diagnosis of the tumour and tumour like lesions with high diagnostic accuracy. This technique was first used by Forkner in 1927 for lesion of excised lymph node. [1-6]

Bamforth and Osborn in 1958 have reported satisfactorily about imprint and scrape technique. In 1999, the College of American Pathologists recommended that sentinel lymph nodes from breast cancer can be examined intraoperatively by cytologic methods like imprint and scrape cytology for the staging of the disease. [25]

Subsequent to these initial trials, the use of imprint and scrape cytology was often neglected in comparison with frozen section, probably due to the relatively higher level of confidence in frozen section by the pathologists. Although many studies have showed that the diagnostic accuracy of imprint and scrape cytology is comparable to that of frozen section. However, this technique not only preserves tissue for further processing but also helps in avoiding freezing artifact which is the advantage of imprint and scrape over the frozen section. [9]

Following this, few authors did imprint and scrape preparation studies on breast lesions, oral cavity, gastrointestinal lesions, female genital tract lesions, male genital tract lesions, thyroid lesions, soft tissue lesions, salivary gland lesions and lesions of lungs & kidney.[1,9,10,25]

Meher R *et al*[1] studied the role of imprint smears of various lesions. Their study included 100 cases from different sites like breast, female genital tract, male genital tract, thyroid gland, soft tissue, kidney and salivary gland.

Kolte *et al*[9] did study of imprint and scrape cytology in diagnosis of various surgically resected tumours. In their study they included tumours of genitourinary tract, gastrointestinal tract,

breast, soft tissue, skin, thyroid, bone and testis.

Mahore S *et al*[10] in their study of Scrape Cytology in Rapid Intraoperative Diagnosis of Tumors included 169 surgically resected specimens from various sites like oral cavity, thyroid, parathyroid, lung, GIT, liver, kidney, testis, breast, ovary and soft tissue.

They concluded that imprint and scrape cytology is simple, easy and reliable technique for the diagnosis of tumour. Further they also mentioned that imprint and scrape cytology has high diagnostic accuracy with better preservation of cellular features and can be used as a tool for rapid diagnosis of various tumour and tumour like lesions.

Regardless of its rapidity, simplicity and better preservation of the cellular details, imprint and scrape cytology is not being used widely. Pathologists are acquainted with the steadfastness of diagnosis by frozen section and are also equally aware of the drawbacks associated with frozen section technique which are mostly due to technical, sampling and interpretation errors. In order to overcome these drawbacks, some of the pathologists preferred combined use of frozen section and cytological examination of intra-operative specimens as a tool for appropriate diagnosis. These authors found that accuracy was better in combined approach of frozen section and cytological examination method than frozen section diagnosis alone.[11,12,17]

"WORLD HEALTH ORGANIZATION (WHO) CLASSIFICATION OF TUMOUR AND TUMOUR LIKE LESIONS OF OVARY:

In 1961 the Cancer Committee of the "International Federation of Gynecology and Obstetrics" (FIGO) proposed histopathological classification of common epithelial ovarian tumours. In 1n 1973, WHO published the classification put forth by FIGO which considered morphological features in addition to the histopathological features. In late 1980, the International Society of Gynecologic Pathologist gave a new classification, which was adopted and revised multiple times since then.[55]

In 2014, WHO has classified ovarian tumours based on the histogenesis, etiopathogenesis and prognosis of ovarian tumour as follows:[55]

“EPITHELIAL TUMOURS

Serous tumours

Benign

Serous cystadenoma

Serous adenofibroma

Serous surface papilloma

Borderline

Serous borderline tumour / Atypical proliferative serous tumour

Serous borderline tumour – micropapillary variant / Non-invasive low-grade serous carcinoma

Malignant

Low-grade serous carcinoma

High-grade serous carcinoma

Mucinous tumours

Benign

Mucinous cystadenoma

Mucinous adenofibroma

Borderline

Mucinous borderline tumour / Atypical proliferative mucinous tumour

Malignant

Mucinous carcinoma

Endometrioid tumours

Benign

Endometrioid cystadenoma

Endometrioid adenofibroma

Borderline

Endometrioid borderline tumour / Atypical proliferative endometrioid tumour

Malignant

Endometrioid carcinoma

Clear cell tumours

Benign

Clear cell cystadenoma

Clear cell adenofibroma

Borderline

Clear cell borderline tumour / Atypical proliferative clear cell tumour

Malignant

Clear cell carcinoma

Brenner tumours

Benign

Brenner tumour

Borderline

Borderline Brenner tumour / Atypical proliferative Brenner tumour

Malignant

Malignant Brenner tumour

Seromucinous tumours

Benign

Seromucinous cystadenoma

Seromucinous adenofibroma

Borderline

Seromucinous borderline tumour / Atypical proliferative seromucinous tumour

Malignant

Seromucinous carcinoma

Undifferentiated carcinoma

MESENCHYMAL TUMOURS

Low-grade endometrioid stromal sarcoma

High-grade endometrioid stromal sarcoma

MIXED EPITHELIAL AND MESENCHYMAL TUMOURS

Adenosarcoma

Carcinosarcoma

SEX CORD-STROMAL TUMOURS

Pure stromal tumours

Fibroma

Cellular fibroma

Thecoma

Luteinized thecoma associated with sclerosing peritonitis

Fibrosarcoma

Sclerosing stromal tumour

Signet-ring stromal tumour

Microcystic stromal tumour

Leydig cell tumour

Steroid cell tumour

Steroid cell tumour, malignant

Pure sex cord tumours

Adult granulosa cell tumour

Juvenile granulosa cell tumour

Sertoli cell tumour

Sex cord tumour with annular tubules

Mixed sex cord-stromal tumours

Sertoli-Leydig cell tumours

Well differentiated

Moderately differentiated

With heterologous elements

Poorly differentiated

With heterologous elements

Retiform

With heterologous elements

Sex cord-stromal tumours, NOS

GERM CELL TUMOURS

Dysgerminoma

Yolk sac tumour

Embryonal carcinoma

Non-gestational choriocarcinoma

Mature teratoma

Immature teratoma

Mixed germ cell tumour

MONODERMAL TERATOMA AND SOMATIC-TYPE TUMOURS ARISING FROM A DERMOID CYST

Struma ovarii, benign

Struma ovarii, malignant

Carcinoid

Strumal carcinoid

Mucinous carcinoid

Neuroectodermal-type tumours

Sebaceous tumours

Sebaceous adenoma

Sebaceous carcinoma

Other rare monodermal teratomas

Carcinomas

Squamous cell carcinoma

GERM CELL - SEX CORD-STROMAL TUMOURS

Gonadoblastoma, including gonadoblastoma with malignant germ cell tumour

Mixed germ cell-sex cord stromal tumour, unclassified

MISCELLANEOUS TUMOURS

Tumours of rete ovarii

Adenoma of rete ovarii

Adenocarcinoma of rete ovarii

Wolffian tumour

Small cell carcinoma, hypercalcaemic type

Small cell carcinoma, pulmonary type

Wilms tumour

Paraganglioma

Solid pseudopapillary neoplasm

MESOTHELIAL TUMOURS

Adenomatoid tumour

Mesothelioma

SOFT TISSUE TUMOURS

Myxoma

Others

TUMOUR-LIKE LESIONS

Follicle cyst

Corpus luteum cyst

Endometriotic cyst

Large solitary luteinized follicle cyst

Hyperreactio luteinalis

Pregnancy luteoma

Stromal hyperplasia

Stromal hyperthecosis

Fibromatosis

Massive oedema

Leydig cell hyperplasia

Others

LYMPHOID AND MYELOID TUMOURS

Lymphomas

Plasmacytoma

Myeloid neoplasms

SECONDARY TUMOURS

Metastatic colorectal adenocarcinoma

Metastatic gastric adenocarcinoma

Metastatic adenocarcinoma from the pancreas, gallbladder, or intra- or extrahepatic bile ducts,

including Ampulla of Vater

Metaststic Adenocarcinoma from appendix

Metastatic ductal /lobular breast carcinoma

Others"[55]

CYTOMORPHOLOGY OF TUMOUR AND TUMOUR LIKE LESIONS OF OVARY

EPITHELIAL TUMOURS OF OVARY

Benign Serous Tumours

Benign serous tumours are predominantly cystic and are lined by cuboidal to columnar epithelium. Columnar epithelium may be either ciliated or non-ciliated.[46]

In serous cystadenoma, imprint and scrape smears show low to high cellularity with singly scattered cuboidal to columnar epithelial cells having round to oval nuclei. Occasionally lamellated calcium deposits and detached ciliary tufts may be seen in the background. Imprint or scrape smear in adenofibroma shows stromal cells.[53]

Serous Borderline Tumour and Serous carcinoma

Serous carcinoma is the most common malignant ovarian tumour which is usually bilateral and consists of solid and cystic areas. Serous borderline tumours are predominantly cystic but show foci of thickened cyst wall or solid area. The distinction between borderline and malignant serous tumors of the ovary is done solely on the basis of stromal invasion. On cytology it is difficult to distinguish borderline serous cystadenoma and well differentiated serous carcinoma.[51]

Cytology smears of borderline serous tumours show low cellularity. The cells are usually arranged in branching clusters and sheets. In these cells cytologic atypia is minimal with moderate nuclear enlargement and occasional prominent nucleoli with moderate amount of vacuolated cytoplasm. [59]

Cytology smears of serous carcinomas usually show high cellularity. Tumour cells are

arranged in papillary pattern. Tumour cells are large, pleomorphic having hyperchromatic pleomorphic nuclei with irregular coarse chromatin. In some cells prominent nucleoli are also noted. Cytoplasm is moderate to abundant and vacuolated. Occasionally lamellated calcified material may be seen.[59]

Benign Mucinous Tumours

Commonest mucinous tumour is mucinous cystadenoma. On cut surface it is usually multiloculated and filled with gelatinous material. [47]

Cytology smears show low to moderate cellularity. Tumour cells are columnar and are arranged in clusters and sheets with honeycomb-like pattern. These cells have well defined cell membranes. Also cells resembling endocervical cells or goblet cells are noted. Intracellular and extracellular mucin is frequently present. [51]

Mucinous Borderline Tumour and Mucinous carcinoma

Mucinous tumours are usually large and multiloculated. In mucinous carcinoma solid areas and papillary excrescence are noted on cut surface.[16]

Cytology smears of mucinous carcinoma usually show high cellularity. Tumour cells are in sheets, clusters and scattered singly. Tumour cells are columnar, containing abundant mucin. Nuclei of these tumour cells are round to oval. Mild nuclear atypia is noted in these cells. On cytology it is difficult to differentiate between borderline mucinous tumour and mucinous carcinoma.[47]

Endometrioid Carcinoma

Endometrioid carcinoma accounts for about 10% - 20% of ovarian tumours and is usually bilateral. Endometrioid carcinomas are solid and cystic showing focal areas of hemorrhage and necrosis.[46]

Cytology smears shows high cellularity with cells arranged in acinar pattern, sheets and infrequent papillae. Tumour cells show hyperchromatic nuclei with granular nuclear chromatin

having irregular nuclear membrane and prominent nucleoli. The amount of cytoplasm is scant. Background is hemorrhagic and contains hemosiderin laden macrophages.[59]

Clear Cell Carcinoma

Clear cell carcinomas are usually solid and cystic tumours containing one or more white or yellow polypoid masses. [49]

Cytologically, tumour cells are large with pleomorphic eccentric nuclei having granular chromatin and prominent nucleoli. Cytoplasm is abundant and show vacuolations. Mitoses and intranuclear inclusions may be present. Extracellular eosinophilic material is usually noted in a necrotic background. [59]

Brenner Tumour

Brenner tumours are type of the transitional cell tumours of ovary. These are hormonally active and are associated with signs of hyperestrinism. Majority of brenner tumours are solid, however few may have small to large cystic areas showing mucinous differentiation. [49]

Cytology shows clusters and sheets of transitional cells, which are round, with round to oval nuclei having prominent, longitudinal nuclear grooving resembling coffee beans. Background shows fibroblasts from the ovarian stroma.[59]

GERM CELL TUMOURS

Immature Teratoma

Cytology smears show varying pattern and depends on the area selected for scrape or imprint cytology. Neoplastic cells are arranged in clusters and scattered singly. Various components such as immature neuroepithelial cells forming rosette- like structures, keratinized squamous cells, squamoid metaplastic cells and immature glial appearing cells are noted. Also noted undifferentiated cells having round to oval nuclei with high nucleo- cytoplasmic ratio with one to two small distinct nucleoli and scant cytoplasm.[58,59]

Mature Teratoma

Cut surface of mature teratoma shows variegated appearance with solid and cystic areas. Cytology smears mainly shows acellular amorphous material with many anucleate squames, ciliated columnar cells, mucinous cells and occasionally detached ciliary tufts.[58]

MONODERMAL TERATOMA:

Struma ovarii

In Struma ovarii, thyroid follicular cells comprised by columnar or cuboidal cells with uniform round nucleus are noted. Background of the smear shows eosinophilic colloid material.[59]

Carcinoid Tumour

Cytology of carcinoid tumour shows loose clusters and singly scattered tumour cells. These cells are round, with round to oval nuclei having granular nuclear chromatin giving "salt-and-pepper" appearance. Cytoplasm is granular and eosinophilic.[59]

Dysgerminoma

Cytology of dysgerminoma shows high cellularity, comprised of monotonous population of tumour cells arranged in clusters and scattered singly. Nuclei of these cells are round to oval, having one to two prominent nucleoli. Cytoplasm is moderate in amount and eosinophilic. Background shows many small lymphocytes, areas of hemorrhage and necrosis. Also noted atypical mitosis. [59]

Embryonal Carcinoma

This tumour shows high cellularity on cytology. Tumour cells are large and pleomorphic having centrally placed vesicular nucleus with multiple nucleoli. Cytoplasm is pale and distinctly vacuolated. Bizarre cells and mitosis are frequently seen. Hemorrhage and tumour necrosis may be prominent.[59]

Yolk Sac Tumour (Endodermal Sinus Tumour)

Cytology of yolk sac tumour show pleomorphic cells with round to oval nucleus and prominent nucleoli. Cytoplasm is moderate to abundant and vacuolated. Some cells show intracytoplasmic hyaline globules. Background may show mucoid areas and basement membrane like material. [50]

Choriocarcinoma

Cytology smears are usually hypocellular showing admixture of malignant syncitiotrophoblast and cytotrophoblast in a necrotic and hemorrhagic background. [56]

Tumours of more than one histological type (Mixed germ cell tumour)

For proper identification of various components in mixed germ cell tumour, extensive sampling and thorough evaluation of the smears is must. These tumours show cytological features based on germ cell elements in the tumour. [54]

SEX CORD-STROMAL TUMOURS

Granulosa Cell Tumour

Cytology smears in adult granulosa cell tumour show high cellularity comprised of small to medium sized cells having centrally placed, round to oval nucleus with fine nuclear chromatin. 20% cases show coffee bean nuclei with nuclear grooves. Cytoplasm is scant and pale. Mitosis is rare. In few cases, eosinophilic material surrounded by granulosa cells is noted.[59]

Juvenile granulosa cell tumour on cytology show cells arranged in loose clusters and scattered singly. These tumour cells are round, with round to oval nuclei having fine nuclear chromatin with prominent nucleoli. Nuclear grooves are absent. Cytoplasm is granular and moderate in amount. Sometimes mitosis are seen. Call-Exner bodies are usually absent.[55]

Thecoma

Cytology smears show high cellularity composed of tumour cells arranged in clusters and scattered singly. These cells are elongated, with spindle shaped nuclei having fine uniform nuclear

chromatin. Cytoplasm shows vacuolations. These vacuoles show positivity after doing special stain for lipid.[53]

Fibroma

These tumours show low cellularity on cytology. Tumour cells are spindle shaped having fine uniformly distributed nuclear chromatin as seen in thecoma. Hence on cytology, differentiation between thecoma and fibroma is difficult.[52,55]

FIBROSARCOMA:

Cytology smears in fibrosarcoma are usually cellular comprised of spindle shaped cells arranged in storiform or herringbone pattern. They exhibit moderate to severe cytological atypia and high mitotic rate.[51]

SERTOLI - LEYDIG CELL TUMOUR:

Cytology smears show small round to oval monotonous population of cells arranged in papillary pattern. These papillary fragments are lined by cuboidal cells. Mild atypia is noted in these cuboidal cells.[58,59]

SEX CORD TUMOUR WITH ANNULAR TUBULES:

Cytology smears shows highly cellular three dimensional tubular structures, metachromatic hyaline masses and uniform neoplastic cells dispersed singly and in cohesive clusters.[49]

STEROID CELL TUMOUR:

Steroid cell tumour- NOS

Cytology smears of steroid cell tumour show cells arranged in sheets. Tumour cells are large, polygonal having small central round nuclei with conspicuous nucleoli. Cytoplasm of these cells show abundant, multivacuolated cytoplasm. Also noted few cells showing granular eosinophilic cytoplasm. Vascular stromal tissue fragments can also be seen on the background.[59]

Leydig cell tumour

Cytological smears show large round to polygonal cells having abundant eosinophilic cytoplasm. About 25% of tumours have tendency to develop malignancy. Malignant tumours are larger, pleomorphic and show hemorrhage and necrosis on the background.[53]

MIXED GERM CELL - SEXCORD STROMAL TUMOURS:

GONADOBLASTOMA:

Cytology smears of gonadoblastoma show mixture of primordial germ cells. Cytological features similar to dysgerminoma and sex cord stromal cells are noted with small islands of granulosa cells. Foci of hyalinization and calcification are commonly seen on the background.[59]

LYMPHOID TUMOURS:

NON HODGKINS LYMPHOMA:

Cytology smears show high cellularity comprised of dispersed monomorphic lymphoid cells which are large, having round nuclei, with inconspicuous nucleoli having scant cytoplasm.[58]

SECONDARY TUMOURS (METASTATIC TUMOURS):

The commonest tumours that metastasize to ovary are the tumours arising in the genitourinary tract, stomach, breast and colon. In majority of cases, differentiation between primary tumours of ovary and metastatic tumours is not possible by cytology alone.

Metastasis from colon and rectum on cytology show high cellularity, abundant mucin, as well as single cells and numerous cell clusters showing loss of cohesion and polarity on necrotic and hemorrhagic background. Tumour cells are pleomorphic, showing high nuclear atypia, irregular nuclear membrane and prominent macro nucleoli. Cytoplasm is vacuolated or granular, with well- defined borders.[58,59]

Krukenberg Tumours

Cytology of Krukenberg tumours show high cellularity with numerous typical signet- ring cells and pale vacuolated cytoplasm.[59]

TUMOUR LIKE LESIONS OF OVARY:

Most of the times tumour like lesions of ovary are diagnosed incidentally either by ultrasonography or during laparotomy.

Endometriotic Cysts

Endometriosis usually can form a tumour-like lesion of the ovary. To provide diagnosis of endometriotic cyst, it is necessary to have any two of the following findings: endometrial stroma, endometrial glands and hemosiderin pigment. [48]

Cytology smears show epithelial cells of the endometrial glands arranged in clusters and sheets. These cells are small, with round to oval nuclei, inconspicuous nucleoli and scant cytoplasm. Occasionally stromal cells having oval nucleus with scant amount of cytoplasm is also seen. Frequently hemosiderin-laden macrophages are also noted. [59]

Pregnancy luteoma:

Cytology smears of pregnancy luteoma show moderate to high cellularity comprised of luteal cells arranged in clusters and sheets. These luteal cells are polygonal with round to oval vesicular nuclei having prominent nucleoli. Cytoplasm is abundant in amount and is eosinophilic.[55]

Stromal hyperplasia:

Cytology smears of stromal hyperplasia show high cellularity comprised of ovarian stromal cells arranged in clusters and sheets.[59]

MATERIALS AND METHODS

Source of data: A prospective study was done on the surgically resected specimens of tumours and tumour like lesions of ovary sent to histopathology section in The Department of Pathology, B.L.D.E (DEEMED TO BE) University, Shri B.M.Patil Medical College, Hospital and Research Centre, Vijayapura. Study period: 1st December, 2017 – 30th June, 2019

Inclusion criteria:

All surgically resected tumours and tumour like lesions of ovary received for histopathological examination were included in the study.

Exclusion criteria:

Completely cystic ovarian lesions without solid component were excluded from the study.

Method of collection of data:

Technique for imprint and scrape smear:

Gross examination of the surgically resected specimen of tumour and tumour like lesions of ovary was done. Then the specimen was cut into two halves with a sharp knife/scalpel. The cut surface was gently mopped with a dry gauze or filter paper to remove excess of blood, fluid or any cystic contents. The most appropriate and representative area was selected for imprint and scraping.

For imprint smear preparation, slide was gently touched on the freshly cut surface of the specimen, avoiding a gliding movement. Pressure applied for imprinting will vary with the consistency of the specimen.

For scrape smear preparation the cut surface of ovary was scraped with one end of the slide and smear was prepared on the other slide from the scraped material.

2-4 smears for each case were prepared from different areas which were immediately fixed in 95% ethyl alcohol and stained with Haematoxylin & Eosin (H & E) stain and Papanicolaou (PAP) stain. Total time taken for smear preparation, staining & reporting was about 15 minutes.

HEMATOXYLIN AND EOSIN STAIN:

Procedure:

- Fix smears in 95% ethanol for 15 minutes
- Stain in Hematoxylin solution for 8 – 10 minutes
- Differentiate in 1% acid alcohol for 30 seconds
- Rinse in running tap water
- Bluing in 0.2% ammonia water or saturated lithium carbonate solution for 30 seconds to 1minute
- Counterstain in eosin solution for 30 seconds to 1 minute
- Dehydrate through 95% alcohol, 2 changes of absolute alcohol, 5 minutes each.
- Clear in 2 changes of xylene.
- Mount in DPX.

Interpretation:

Nuclei stains – Blue

Cytoplasm stains – Pink to Red

PAPANICOLAOU STAIN:

Procedure:

- Fix smear in 95% alcohol – 15 min
- Wash with water.
- Stain with Harris Hematoxylin – 5 minutes.
- Wash with water.
- Dip in 1% Acid alcohol.
- Wash in running tap water until bluing.
- Dehydration in 70% alcohol 2 min
- Dehydration in 95% alcohol 2 min
- Dehydration in 95% alcohol 2 min
- Stain in OG 6, for 2 min.
- Rinse in 95% alcohol, 2 min
- Rinse in 95% alcohol, 2 min
- Stain in EA 36, 3 min
- Rinse in 95% alcohol, 1 min
- Drying
- Clearing in Xylene
- Mounting

Interpretation:

- Nuclei – Blue
- Acidophilic cells – Red to orange
- Basophilic cells – Green to Blue green

Fig 1-Imprint and scrape smear preparation

Fig 2- Reagents used for staining

SAMPLE SIZE:

In the study done by Das C *et al*[1] it was found that the overall sensitivity and specificity of benign and malignant ovarian tumours were 94% and 74% respectively and considering prevalence of epithelial tumours to be 64% at 95% confidence level and 10% desired precision, the sample size was calculated by using the following formulas;

$$n = \frac{z^2 p(1-p)}{d^2}$$

$$N = \frac{a+c}{\text{Prevalence}}$$

Where; Z is statistical value at 5% level of significance; d is margin of error; p is anticipated incidence rate among suspected cases.

Minimum sample size for my study was 35. Hence 110 cases were included in the present study.

Statistical analysis:

All the characteristics were descriptively summarized. The summary statistics of number, mean and standard deviation were used for continuous variables. And for categorical data, the number & percentage were used. Fisher exact test/ Chi-square ($\chi 2$) was used to determine the significant difference between the imprint and scrape cytology. The mean difference was analysed with the help of t-test/z test and ANOVA. If the p-value was < 0.05, then the results was considered to be significant.

Statistical software: Data were analyzed using SPSS software v.20.0.

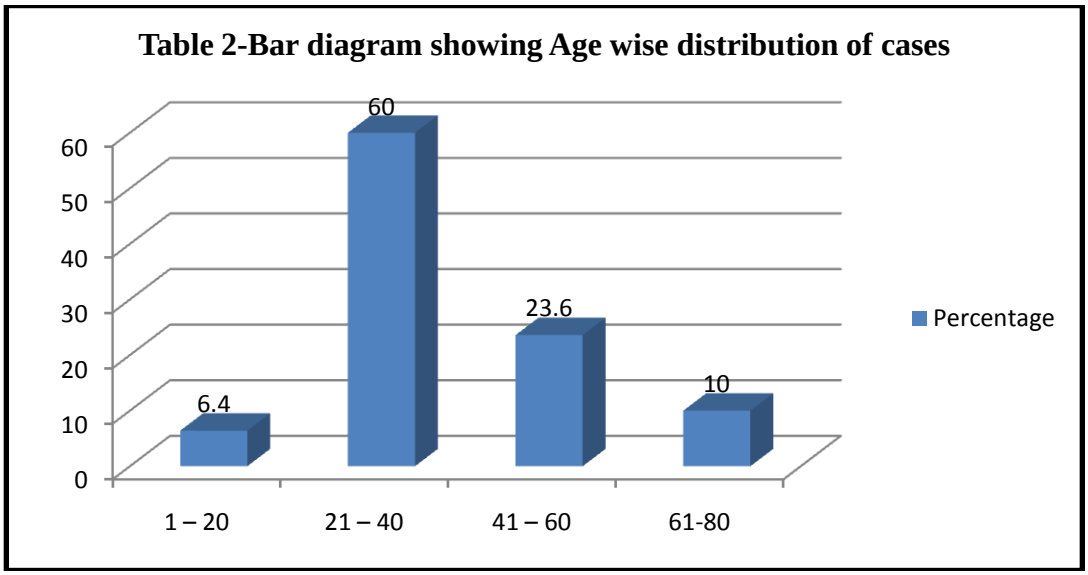
RESULTS AND ANALYSIS

Total 110 cases of tumour and tumour like lesions of ovary were studied from 1st December, 2017 to 30th June, 2019 in which comparative study between imprint and scrape cytology was carried out and further histopathological correlation was done.

Table 1: Age-wise distribution of cases

Age (in years)	No: of cases	Percentage
1- 20	7	6.4
21 – 40	66	60.0
41 – 60	26	23.6
61-80	11	10.0
Total	110	100.0

Table 2-Bar diagram showing Age wise distribution of cases

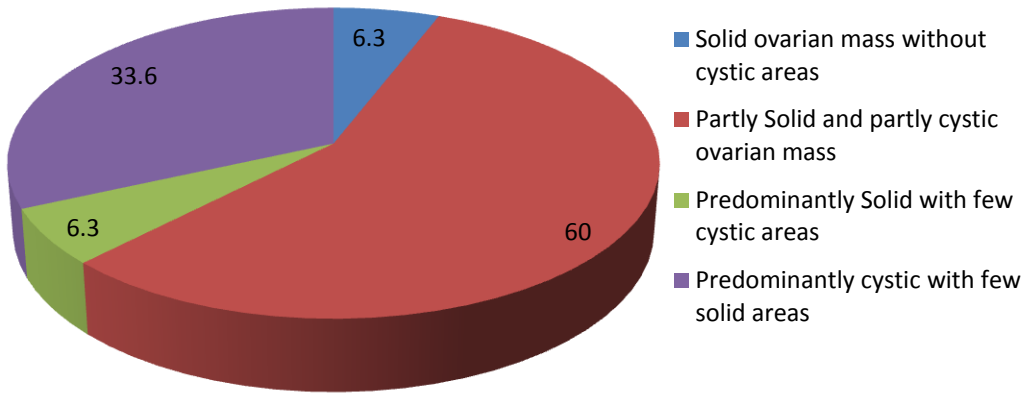


Age group of patients ranged from 6 to 75 years, with the youngest patient aged 6 years and the oldest 75 years with a mean age 40.5 years. Most of the cases were seen in the age group of 21-40years (60%)

Table 3: Distribution of cases based on Gross Morphology of Ovarian mass

Gross Morphology of Ovarian mass	No. of cases	Percentage (%)
Solid ovarian mass without cystic areas	7	6.3
Partly Solid and partly cystic ovarian mass	66	60
Predominantly Solid with few cystic areas	7	6.3
Predominantly cystic with few solid areas	37	33.6
Total	110	100

Table 4: Pie chart showing gross morphology of ovarian mass

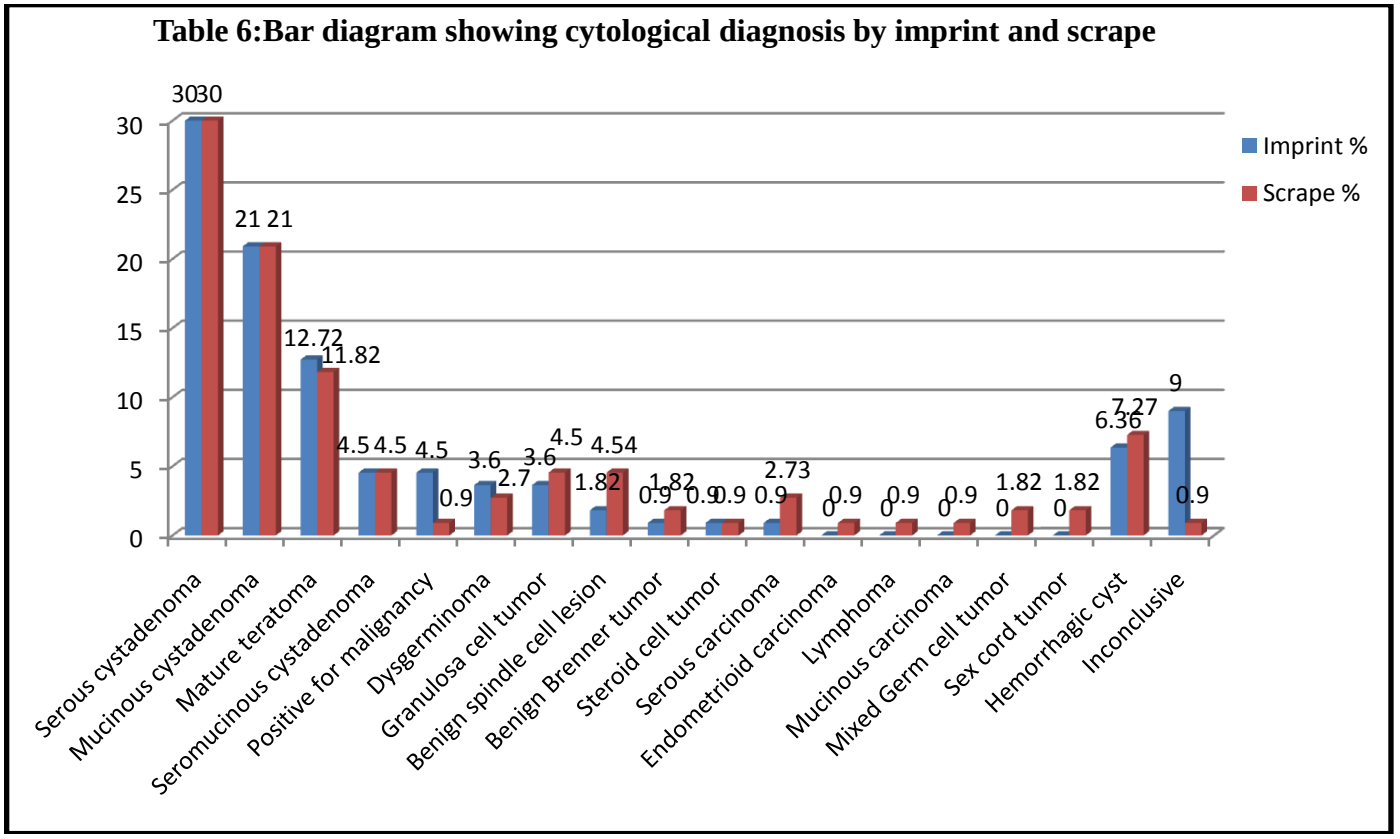


Out of 110 cases, majority of the cases were partly solid and partly cystic accounting for 60% of all cases.

Table 5:Distribution of cases according to cytological diagnosis by imprint & scrape cytology

Cytological diagnosis	Imprint diagnosis		Scrape diagnosis	
	No. of patients	Percentage	No. of patients	Percentage
Serous cystadenoma	33	30	33	30
Mucinous cystadenoma	23	20.91	23	20.91
Mature teratoma	14	12.72	13	11.82
Seromucinous cystadenoma	5	4.54	5	4.55
Positive for malignancy	5	4.54	1	0.90
Dysgerminoma	4	3.64	3	2.73
Granulosa cell tumor	4	3.64	5	4.55
Benign spindle cell lesion	2	1.82	5	4.54
Benign Brenner tumor	1	0.90	2	1.82
Steroid cell tumor	1	0.91	1	0.90
Serous carcinoma	1	0.90	3	2.73
Endometrioid carcinoma	0	0	1	0.90
Lymphoma	0	0	1	0.90
Mucinous carcinoma	0	0	1	0.90
Mixed Germ cell tumor	0	0	2	1.82
Sex cord tumor	0	0	2	1.82
Hemorrhagic cyst	7	6.36	8	7.27
Inconclusive	10	9.0	1	0.9
Total	110	100	110	100

Table 6:Bar diagram showing cytological diagnosis by imprint and scrape



Out of 110 cases, on scrape smear cytology 101 were reported as tumours of ovary and 8 cases were reported as tumour like lesions of ovary. On imprint smear cytology, 93 were reported as tumours of ovary and 7 cases were reported as tumour like lesions of ovary. Diagnosis on imprint was inadequate for opinion in 10 cases (9%) whereas in scrape smear only 1 case was reported as inconclusive.

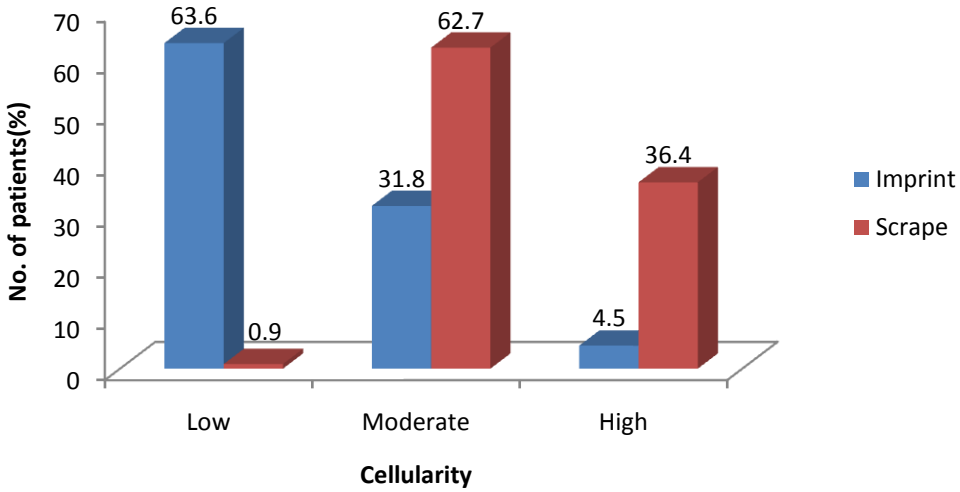
By both imprint and scrape smear cytology technique, common lesions diagnosed were serous cystadenoma(30%) followed by mucinous cystadenoma(20.9%), mature teratoma(11.8%), hemorrhagic cyst(7.2%), granulosa cell tumour(4.5%), dysgerminoma(2.73%), seromucinous cystadenoma(4.5%), mixed germ cell tumour(1.8%), sex cord stromal tumour(1.82%), serous carcinoma(2.7%), mucinous carcinoma(0.9%), benign brenner tumour(1.82%), steroid cell tumour(0.9%), endometrioid carcinoma(0.9%) and Non Hodgkins lymphoma(0.9%).

Four cases of benign spindle cell tumour, 1 case of sex cord tumour, 1 case of benign brenner tumour, 1case of hemorrhagic cyst and I case of Non Hodgkins lymphoma were reported as inconclusive on imprint smears. Two cases of mixed germ cell tumour were reported as dysgerminoma and mature teratoma on imprint smear cytology.

Table 7: Comparison of Cellularity on Imprint and Scrape cytology

Cellularity	Imprint	Percentage	Scrape	Percentage
Low	70	63.6	1	0.9
Moderate	35	31.8	69	62.7
High	5	4.5	40	36.4
Total	110	100.0	110	100.0

Table 8: Bar diagram showing Cellularity on Imprint and Scrape cytology

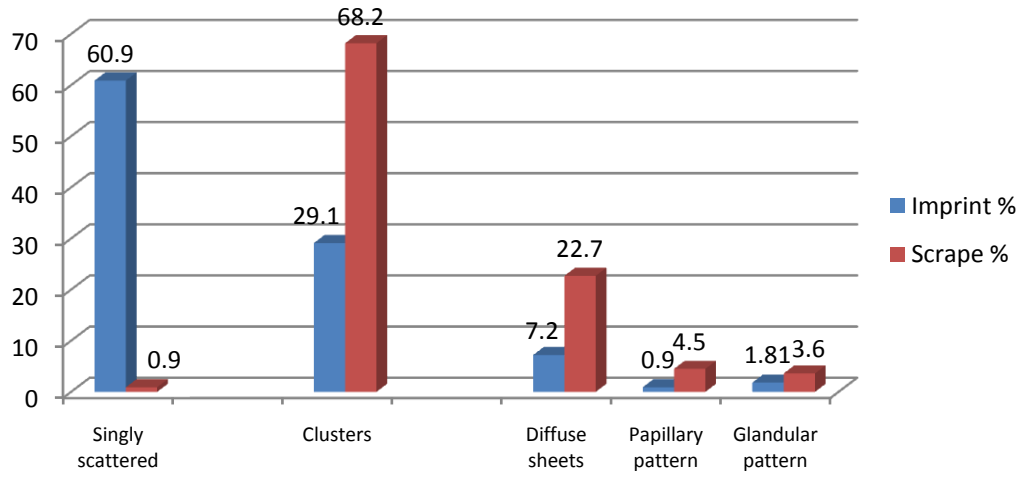


High cellularity was observed in Scrape smears as compared to imprint smears.

Table 9: Comparison of Architectural pattern in Imprint and Scrape cytology

Architectural pattern	Imprint	Percentage	Scrape	Percentage
Singly scattered	67	60.9	1	0.9
Clusters	32	29.1	75	68.2
Diffuse sheets	8	7.2	25	22.7
Papillary pattern	1	0.9	5	4.5
Glandular pattern	2	1.81	4	3.6
Total	110	100.0	110	100.0

Table 10: Bar diagram showing architecture pattern in Imprint and Scrape cytology

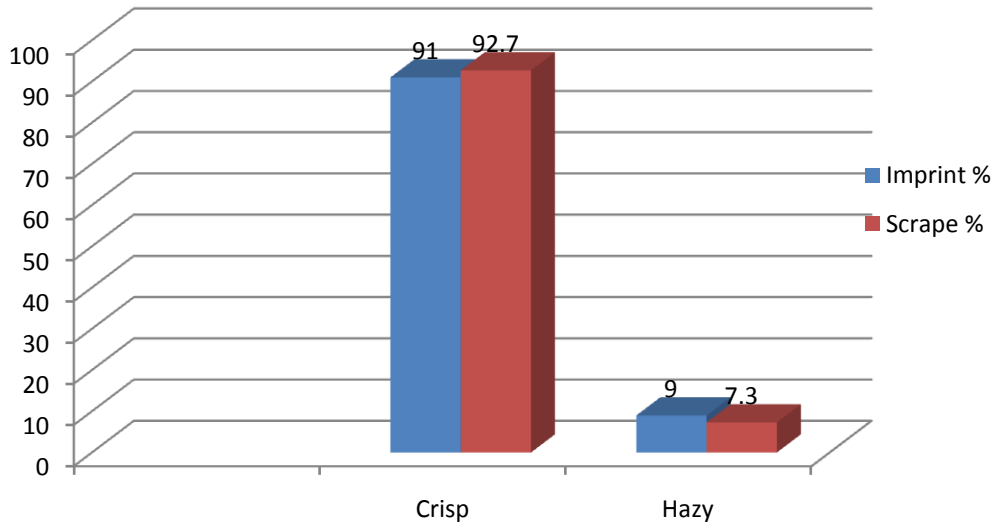


Predominant architectural pattern was arrangement in clusters in the scrape cytology smears whereas in imprint cytology smears the cells were singly scattered in majority of cases.

Table 11: Comparison of Nuclear features in Imprint and Scrape Smear

Nuclear features	Imprint	Percentage	Scrape	Percentage
Crisp	100	91	102	92.7
Hazy	10	9	8	7.3
Total	110	100	110	100

Table 12: Bar diagram showing nuclear features in imprint and scrape smears

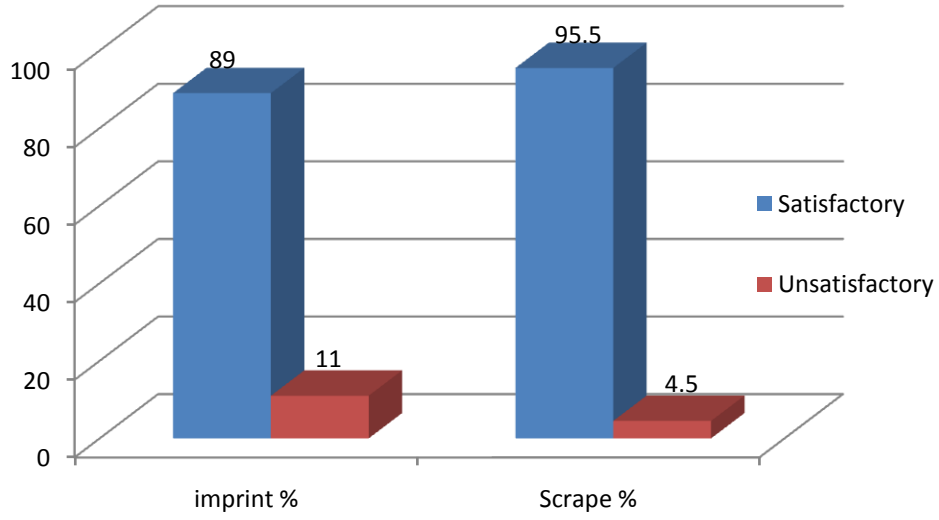


The nuclear features were better appreciated on Scrape cytology smears which showed 102 cases with crisp nuclear chromatin.

Table13: Comparison of Cytoplasmic features in Imprint and Scrape Smear

Cytoplasmic staining	Imprint	Percentage	Scrape	Percentage
Satisfactory	98	89	105	95.5
Unsatisfactory	12	11	05	4.5
Total	110	100.0	110	100.0

Table 14: Bar diagram showing cytoplasmic staining in imprint and scrape

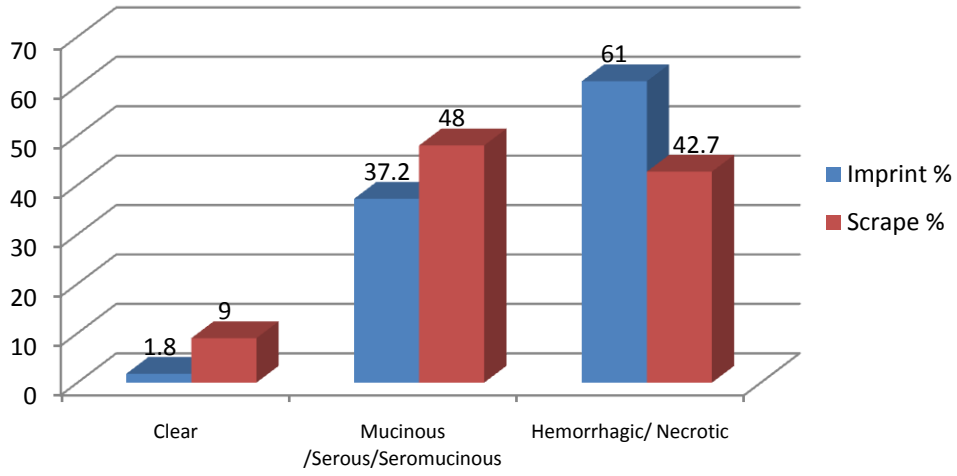


Cytoplasmic staining was satisfactory in relatively more number of scrape smears than imprint smears.

Table 15: Comparison of Background in Imprint and Scrape Smear

Background	Imprint	Percentage	Scrape	Percentage
Clear	2	1.8	10	9
Mucinous /Serous/Seromucinous	41	37.2	53	48
Hemorrhagic/ Necrotic	67	61	47	42.7
Total	110	100.0	110	100.0

Table 16: Bar diagram showing background in Imprint and Scrape

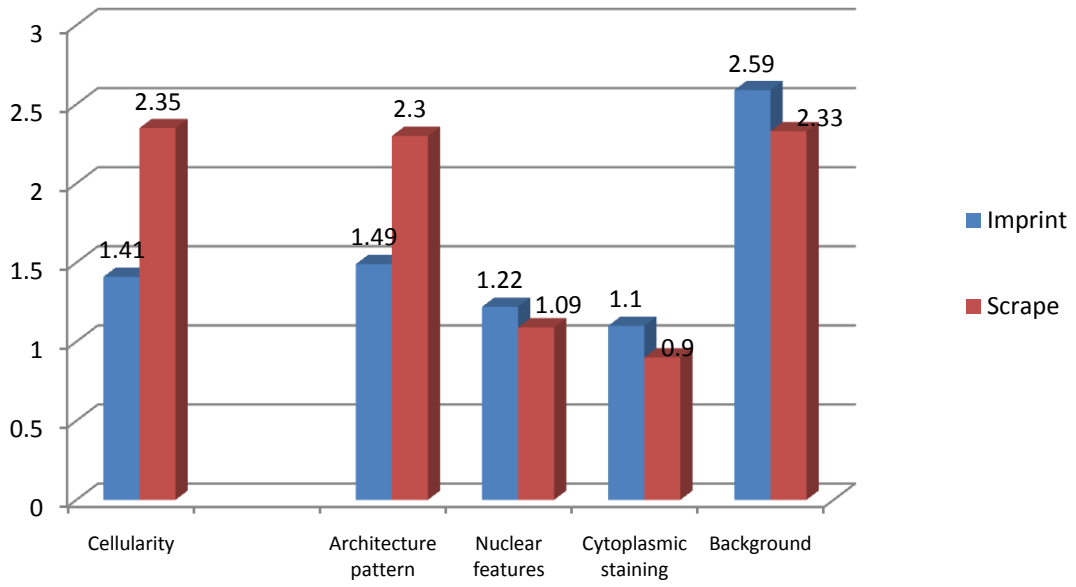


The background features of imprint smears showed more cases with hemorrhagic background.

Table 17: Comparison of various Cytological features in Imprint and Scrape Cytology

Criteria	Imprint		Scrape		Mann Whitney U test	P value
	Sum	Mean± SD	Sum	Mean± SD		
Cellularity	155	1.41(1)±0.58	259	2.35(2)±0.499	U=1727.5	P<0.001 HS
Architecture pattern	164	1.49(1)±0.674	253	2.30(2)± 0.480	U=2288.5	P<0.001 HS
Nuclear features	158	1.22(1)±0.527	160	1.09(1)±0.692	U=4761.5	P=0.765 NS
Cytoplasmic staining	141	1.10(2)±0.673	148	0.90(2)±0.524	U=5611.0	P=0.996 NS
Background	221	2.59(2)±0.530	229	2.33(2)±0.530	U=6050.5	P=0.90 NS
NS: Not significant *HS: Highly significant						

Table18: Bar diagram showing comparison of various Cytological features in Imprint and Scrape Cytology



In cellularity, the total sum of the cumulative score of imprint and scrape smears was 155 and 259 with a mean S.D of 1.41±0.58 and 2.35±0.49 respectively. The statistical difference was highly significant as p value was less than 0.001.

In architectural pattern, sum of the cumulative score of imprint and scrape smears was 164 and 253 with a mean S.D of 1.49±0.674 and 2.30±0.48 respectively. The statistical difference was highly significant as p value was less than 0.0001.

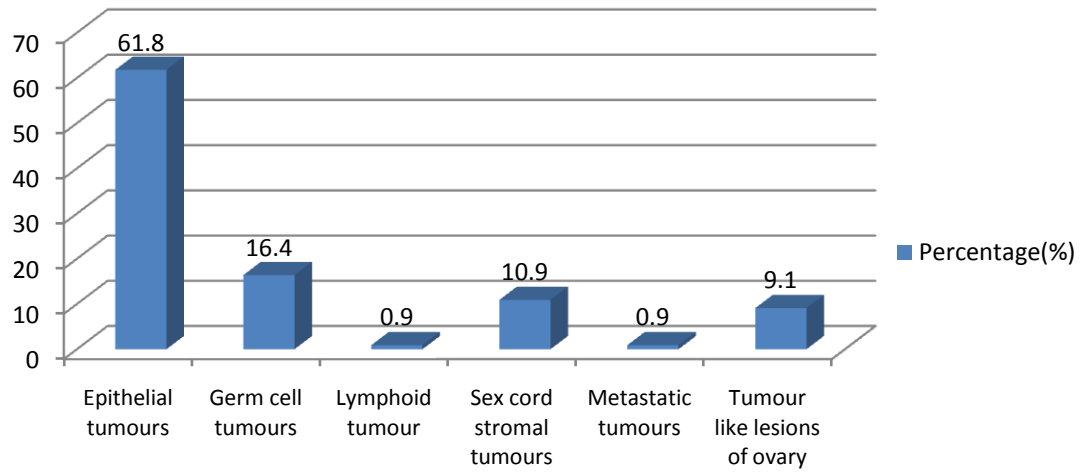
In nuclear features, sum of the cumulative score of imprint and scrape smears was 158 and 160 with a mean S.D of 1.22±0.527and 1.09±0.692 respectively. The statistical difference was not significant as p value 0.765.

In cytoplasmic staining and background features, sum of the cumulative score of scrape smears was higher than imprint smear. However the statistical difference was not significant.

Table 19: Distribution of cases according to histopathological diagnosis (n=110)

SR No:		Histopathological diagnosis	No. of patients	Percentage (%)
1.	Tumours of ovary	Epithelial tumours	68	61.8
		Germ cell tumours	18	16.4
		Lymphoid tumour	1	0.9
		Sex cord stromal tumours	12	10.9
		Metastatic tumours	1	0.9
2.	Tumour like lesions of ovary		10	9.1
	Total		110	100

Table 20: Bar diagram showing cases according to histopathological diagnosis



Out of 110 cases, 91% cases were ovarian tumours and 9% cases were tumour like lesions of ovary on histopathology. In ovarian tumours 68 (61.8%) cases were epithelial tumours, 18(16.4%) cases were germ cell tumours, 12(10.9%) cases were diagnosed as sex cord stromal tumours, 1 case each of lymphoma and metastatic carcinoma (0.9% each).

Table 21: Distribution of Ovarian tumours depending upon Morphological Type and Morphological categorization by histopathological study

Morphological Type	Morphological categorization			
	Benign	Borderline	Malignant	Total
Epithelial tumor	56	7	5	68
	82.3%	10.2%	7.3%	
Germ cell tumor	12	0	6	18
	66.6%	0%	33.3%	
Lymphoid tumor	0	0	1	1
	0%	0%	100%	
Sex cord stromal tumor	10	0	0	10
	100%	0%	0%	
Metastatic	0	0	1	1
	0%	0%	100%	
Total	80	7	13	100

Out of 68 epithelial tumours, 56 cases were benign, 7 were borderline and 5 were malignant tumours. Among 18 germ cell tumours, 12 were benign and 6 were malignant. All the 10 sex cord stromal tumours were benign tumours.

Table 22: Distribution of Tumour like lesions of ovary (n=10)

Tumour like lesion of ovary	No. of patients	Percentage (%)
Endometriotic cyst	8	80
Stromal hyperplasia	1	10
Pregnancy luteoma	1	10
Total	10	100

In tumour like lesions of ovary, 8 cases were endometriotic cyst and 1 case each of pregnancy luteoma and stromal hyperplasia.

Table 23: Distribution of cases according to Histopathological diagnosis

Histopathological diagnosis	No. of patients	Percentage (%)
Serous cystadenoma	32	29
Mucinous cystadenoma	17	15.4
Mature teratoma	12	10.9
Borderline Mucinous cystadenoma	6	5.4
Seromucinous cystadenoma	5	4.5
Granulosa cell tumor	5	4.5
Dysgerminoma	3	2.7
Fibroma	3	2.7
Serous carcinoma	3	2.7
Benign Brenner tumor	2	1.8
Mixed Germ cell tumor	2	1.8
Borderline Serous cystadenoma	1	0.9
Endometrioid carcinoma	1	0.9
Fibrothecoma	1	0.9
Immature teratoma	1	0.9
Sex cord stromal tumor	1	0.9
Sex cord tumor with annular tubules	1	0.9
Steroid cell tumor	1	0.9
Non Hodgkins Lymphoma	1	0.9
Metastatic invasive lobular carcinoma of breast	1	0.9
Mucinous carcinoma	1	0.9
Endometriotic cyst	8	7.3
Pregnancy luteoma	1	0.9
Stromal hyperplasia	1	0.9
Total	110	100

Table 24: Comparison between Cytological and Histopathological diagnosis

Cytological diagnosis	Imprint diagnosis		Scrape diagnosis		Histopathological diagnosis		Chi square test	P value
	No. of cases	%	No. of cases	%	No. of cases	%		
Benign	82	7	90	81.8	80	72.7	X^2=32.001	P<0.0001 HS
Borderline	0	0	0	0	7	6.3		
Malignant	11	10	11	10	13	11.8		
Tumour like lesion of ovary	7	6.3	8	7.2	10	9.0		
Inconclusive	10	9.0	1	0.9	0	0		

Histopathological correlation was done in all 110 cases. Cyto-histological discordance was observed in 17 cases. 7 cases of hemorrhagic cyst were diagnosed on cytology were concluded as endometriotic cyst on histopathology. 6 cases of mucinous cystadenoma and 1 case of serous cystadenoma diagnosed on cytology were concluded as borderline mucinous cystadenoma and borderline serous cystadenoma respectively. 1 case of immature teratoma was diagnosed as mature teratoma on cytology, 1 case of stromal hyperplasia diagnosed on histopathology was reported as benign spindle cell lesion and 1 case of pregnancy luteoma diagnosed on histopathology was reported as inconclusive on cytology.

Table 25: Distribution of Concordance and Discordance cases between Cytological and Histopathological diagnosis

	Cytology Diagnosis				Histopathological diagnosis	%
	Concordance cases	%	Discordance cases	%		
Benign	80	87	0	0	80	72.8
Borderline	0	0	7	39	7	6.3
Malignant	12	13	1	6	13	11.9
Tumour like lesion of ovary	0	0	10	55	10	9.0
Total	92		18		110	100
Chi square test	X2=103.26 p<0.0001* (HS)					

Table 26: Details of cases showing discordance between cytology and histopathology

SR No:	Case No:	Cytology Impression	Histopathology impression
1.	3	Mucinous cystadenoma	Borderline Mucinous cystadenoma
2.	4	Benign spindle cell tumor	Stromal hyperplasia
3.	10	Inconclusive	Pregnancy luteoma
4.	13	Mucinous cystadenoma	Borderline Mucinous cystadenoma
5.	14	Mucinous cystadenoma	Borderline Mucinous cystadenoma
6.	20	Serous cystadenoma	Borderline Serous cystadenoma
7.	21	Hemorrhagic cyst	Endometriotic cyst
8.	24	Hemorrhagic cyst	Endometriotic cyst
9.	27	Hemorrhagic cyst	Endometriotic cyst
10.	31	Hemorrhagic cyst	Endometriotic cyst
11.	40	Hemorrhagic cyst	Endometriotic cyst
12.	46	Hemorrhagic cyst	Endometriotic cyst
13.	47	Hemorrhagic cyst	Endometriotic cyst
14.	50	Mucinous cystadenoma	Borderline Mucinous cystadenoma
15.	52	Mature teratoma	Immature Teratoma
16.	59	Mucinous cystadenoma	Borderline Mucinous cystadenoma
17.	63	Mucinous cystadenoma	Borderline Mucinous cystadenoma

STATISTICAL ANALYSIS:

The sensitivity, specificity, positive predictive value and diagnostic accuracy was calculated as follows;

a. Sensitivity: True positive/true positive + false negative = 88%

b. Specificity: True negative/false positive + true negative = 98.7%

c. Positive predictive value: True positive/true positive + false positive = 91.6%

d. Diagnostic accuracy = 91%

True positive cases were borderline and malignant ovarian tumours which showed correlation between cytology and histopathology. True negative cases were benign ovarian tumours which showed correlation between cytology and histopathology. False positives were cases diagnosed as borderline/ malignant on cytology and benign on histopathology. False negatives were cases diagnosed as benign on cytology and borderline/ malignant on histopathology.

In the present study, the Sensitivity, Specificity, Positive predictive value, Accuracy of imprint and scrape cytology in the diagnosis of benign ovarian tumours were 98.7%, 66.6%, 98.7%, 97.5% and 100%, 88%, 98.7%, 98.8% respectively.

The Sensitivity, Specificity, Positive predictive value, Accuracy of imprint and scrape cytology in the diagnosis of malignant ovarian tumours were 87.5%,66.6%, 87.5%, 81.8% and 91 %, 100%, 100% ,91.6% respectively.

The Sensitivity, Specificity, Positive predictive value, Diagnostic accuracy of imprint and scrape technique in the diagnosis of tumour like lesions of ovary were 85.7%,66.6%, 85.7%, 80% and 89%, 100%, 100%,90% respectively.

GROSS IMAGES AND MICROPHOTOGRAPHS

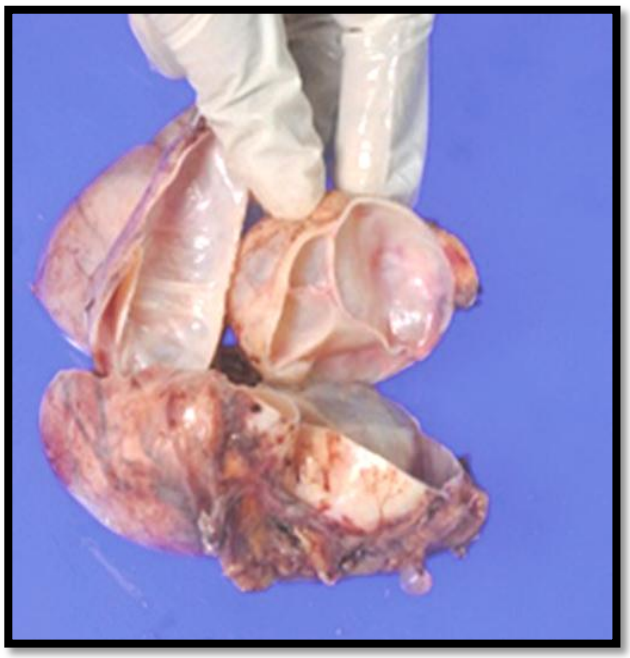


Fig 3- Gross photograph of serous cystadenoma showing multiloculated cyst and focal solid glistening area

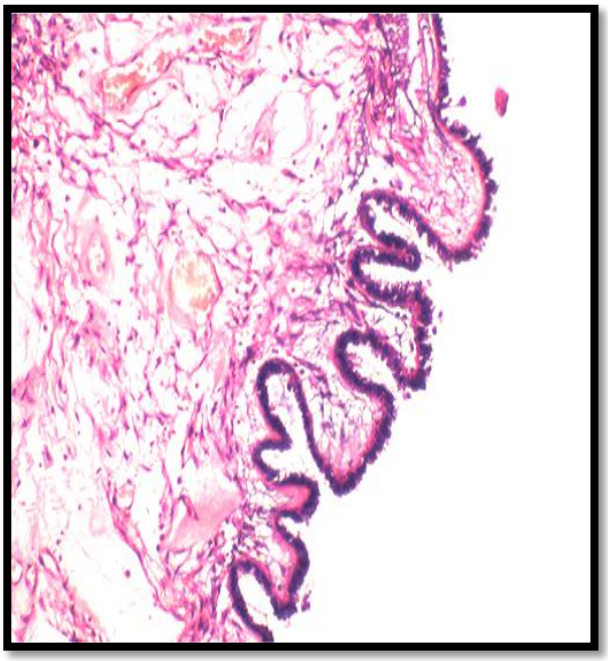


Fig 4- Microphotograph of serous cystadenoma showing cyst wall lined by single layer of cuboidal cells (H&E, 400X)

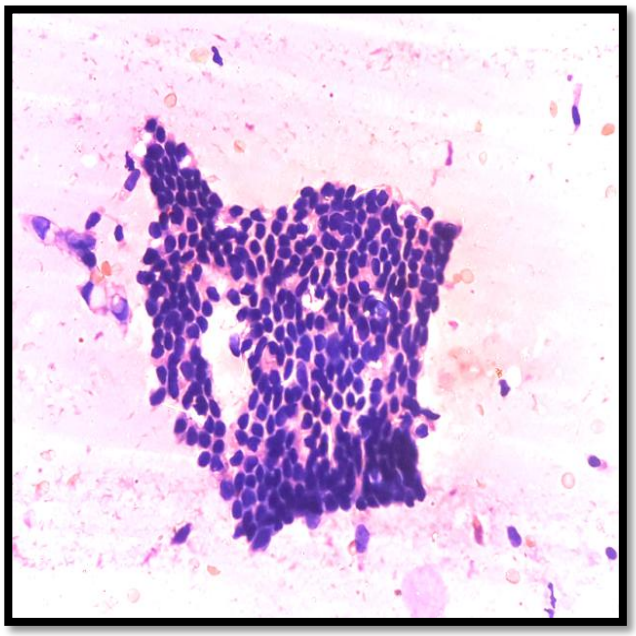


Fig 5-Imprint smear of serous cystadenoma showing moderate cellularity with cells arranged in clusters in a serous background (H&E, 400X)

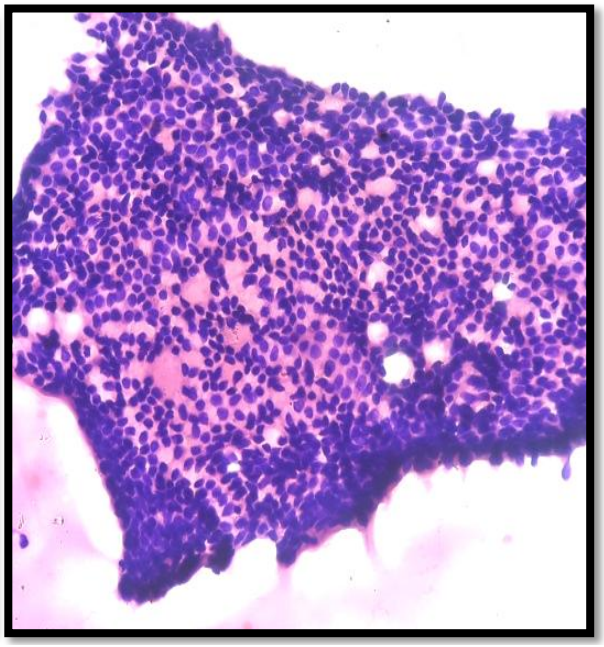


Fig 6 - Scrape smear of serous cystadenoma showing high cellularity with cells arranged in diffuse sheets in a serous background (H&E, 400X)

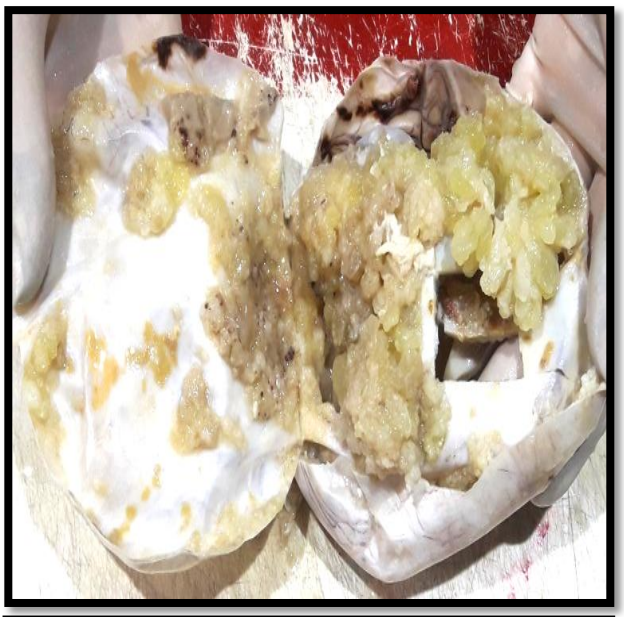


Fig 7- Gross photograph of Serous borderline tumour which is solid and cystic showing intracystic growth of soft papillary excrescences.

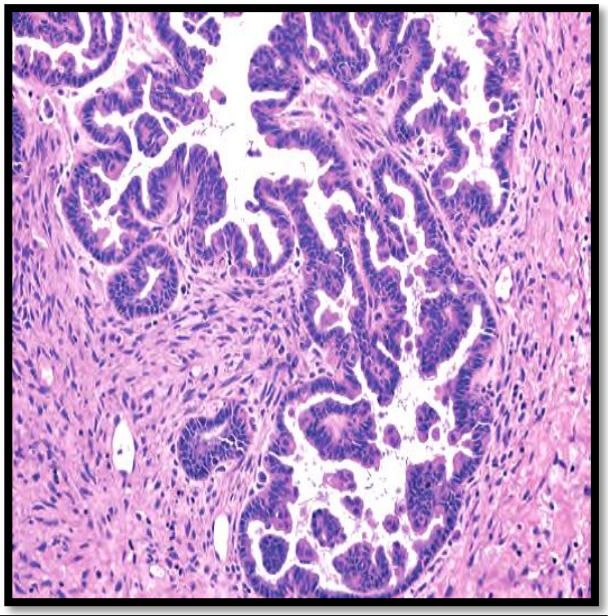


Fig 8- Microphotograph of Serous borderline tumour showing papillae lined by stratified cuboidal-to-columnar epithelium with mild nuclear atypia (H&E, 400X)

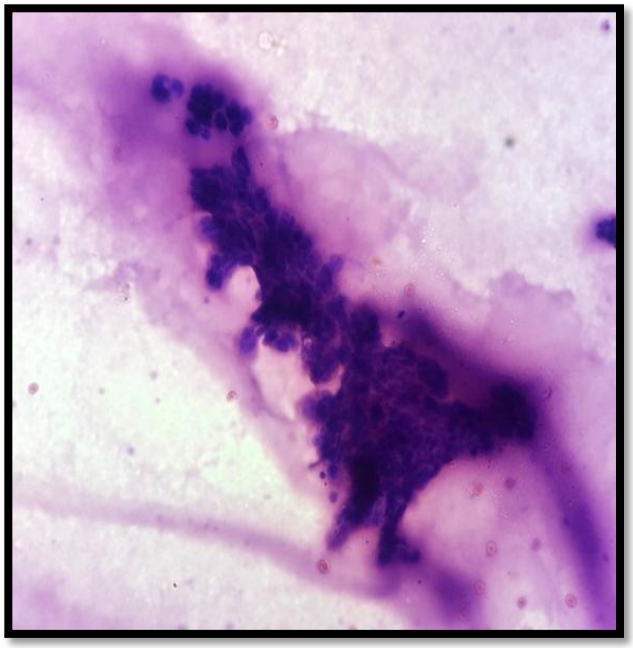


Fig 9- Imprint smear of serous borderline tumour showing moderate cellularity with cells in clusters in a serous background (H&E 400X)

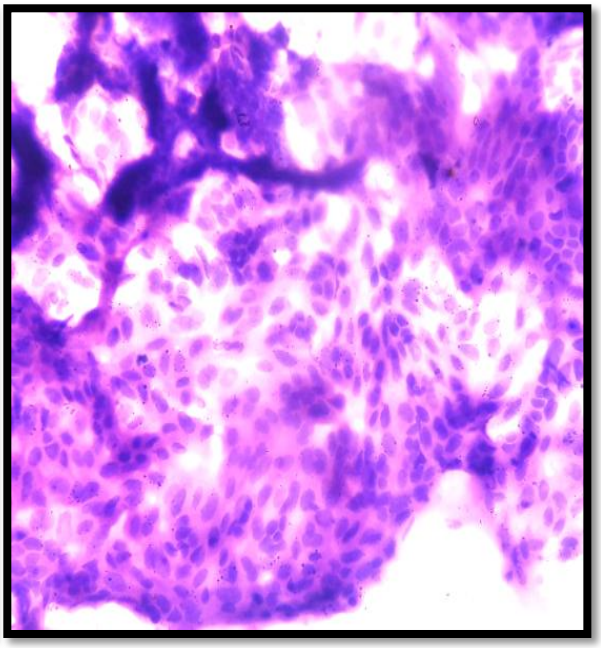


Fig 10- Scrape smear of serous borderline tumour showing high cellularity with cells in sheets (H&E, 400X)

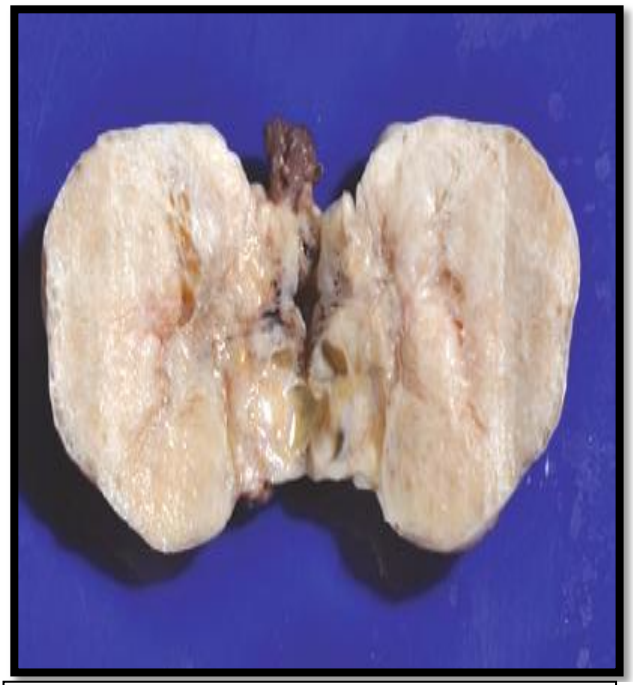


Fig 11- Gross photograph of Serous carcinoma showing solid grey white appearance with few cystic spaces

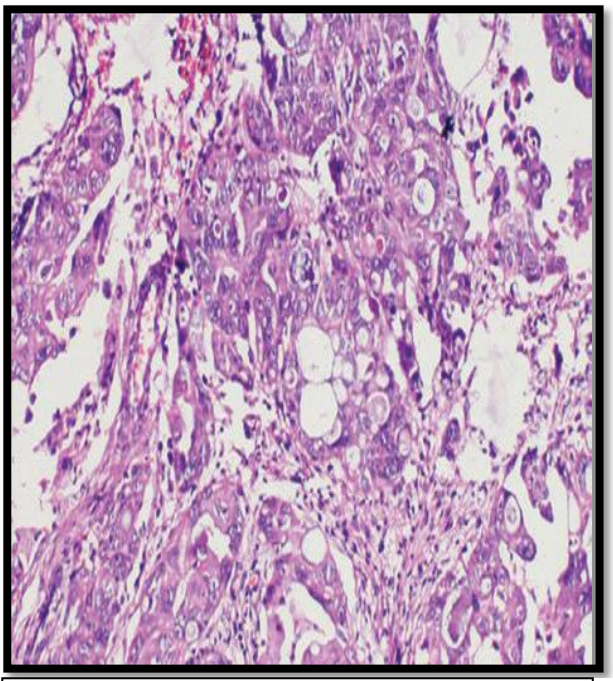


Fig 12- Microphotograph of serous carcinoma showing glands lined by pleomorphic cells with large prominent nucleoli (H&E, 400X)

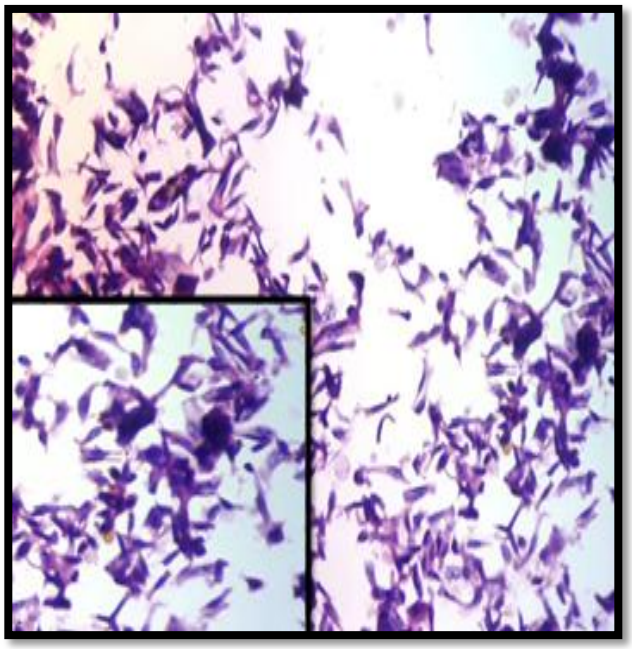


Fig 13- Imprint smear of serous carcinoma showing moderate to high cellularity comprised of columnar cells (H&E 100X). Inset showing pleomorphic nuclei (H&E, 400X)

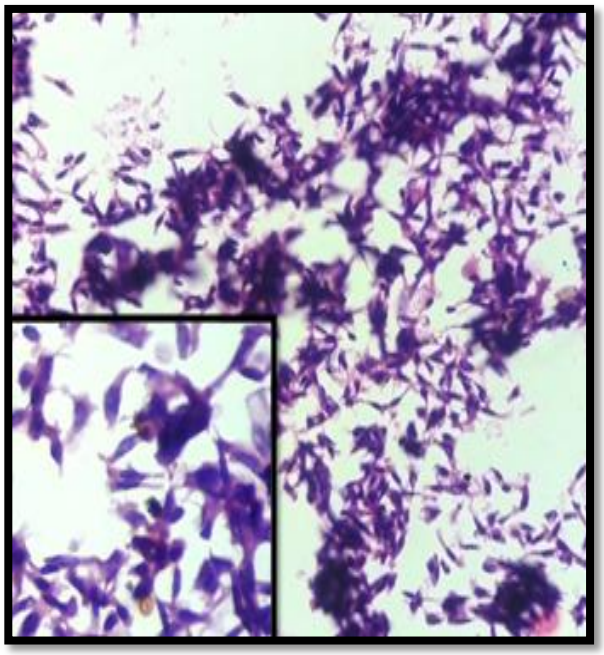


Fig 14- Scrape smear of serous carcinoma showing high cellularity comprised of columnar cells (H&E 100X). Inset showing pleomorphic nuclei (H&E, 400X)

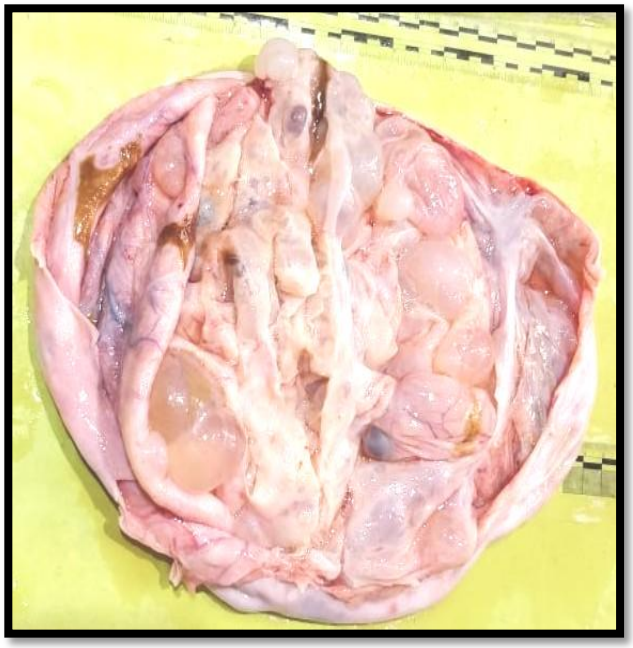


Fig 15- Gross photograph of Mucinous cystadenoma showing multiloculated cysts filled with mucoid material

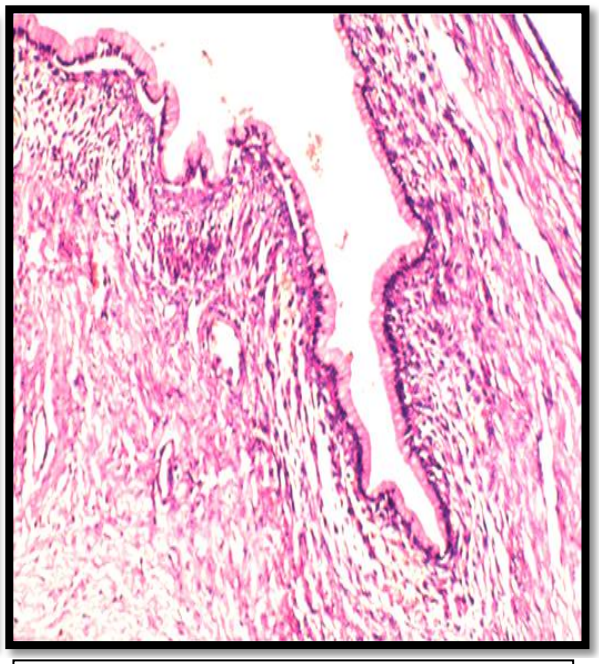


Fig 16- Microphotograph of mucinous cystadenoma showing fibrocollagenous cyst wall lined by mucus secreting columnar epithelium (H&E, 400X)

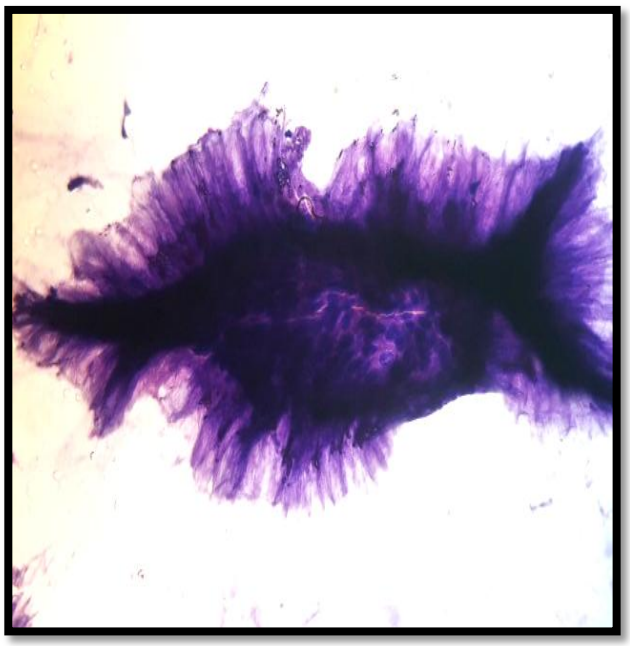


Fig 17- Imprint smear of mucinous cystadenoma showing moderate cellularity comprised of sheets of mucin secreting columnar cells (H&E, 400X)

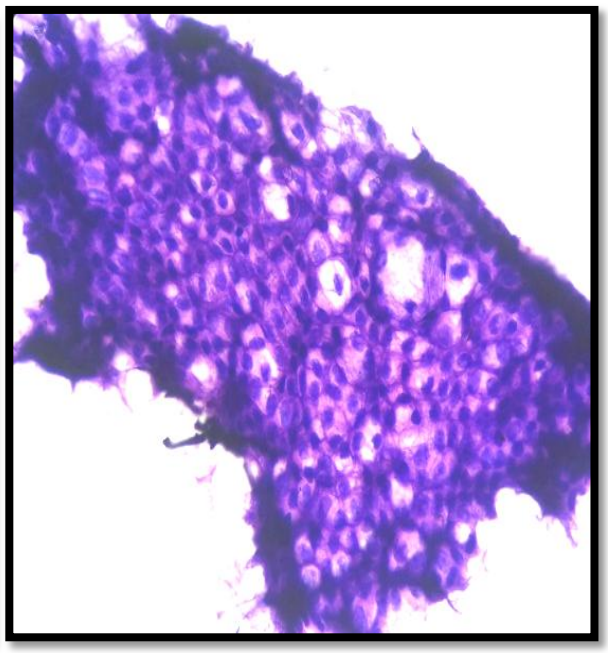


Fig 18- Scrape smear of mucinous cystadenoma showing high cellularity comprised of columnar cells arranged in honey comb like pattern (H&E, 400X)

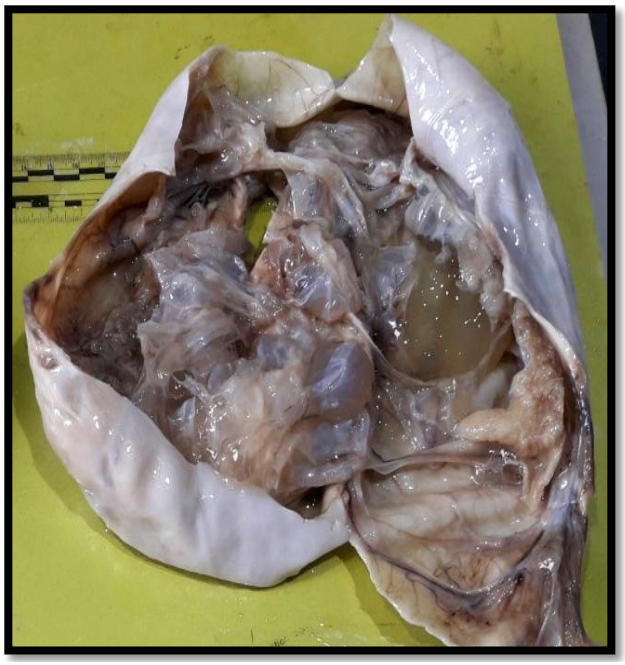


Fig 19- Gross photograph of borderline mucinous tumour showing multiloculated cysts containing mucinous fluid with focal solid area.

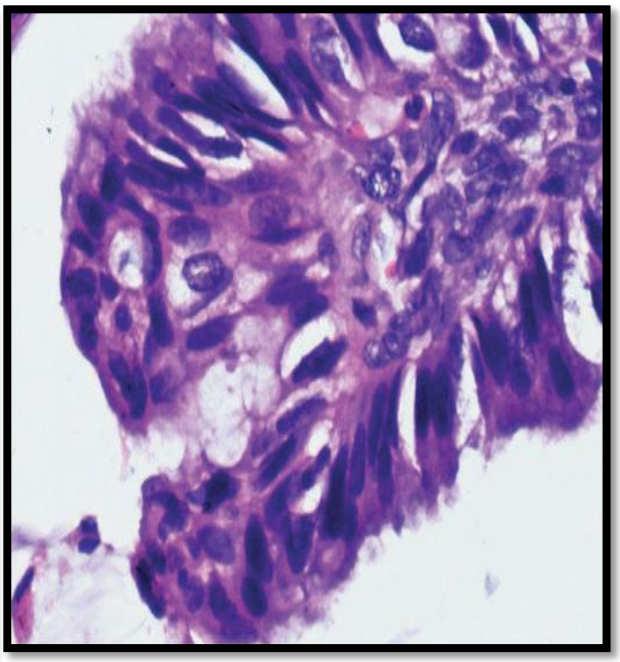


Fig 20- Microphotograph of borderline mucinous tumour showing pleomorphic hyperchromatic nuclei with abundant eosinophilic cytoplasm (H&E, 400X)

Fig 21- Imprint smear of borderline mucinous tumour showing high cellularity comprised of columnar cells arranged in sheets and clusters containing abundant cytoplasm (H&E, 400X)

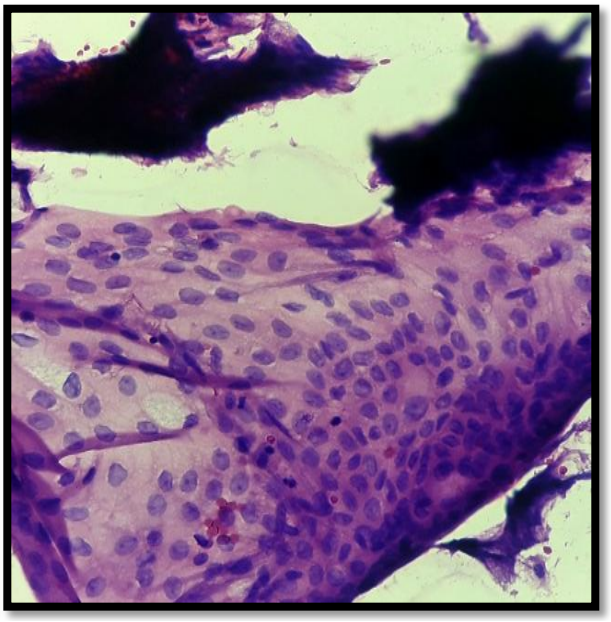


Fig 22- Scrape smear of borderline mucinous tumour showing high cellularity comprised of columnar cells arranged in sheets containing abundant cytoplasm (H&E, 400X)

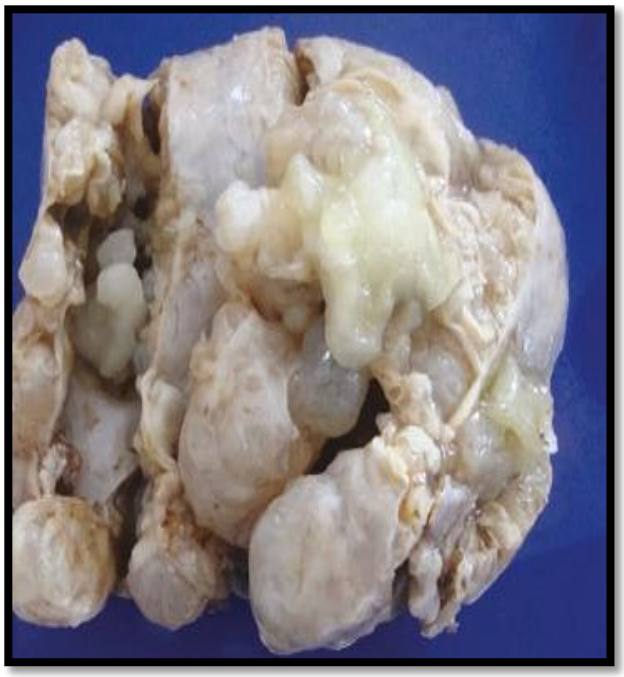


Fig 23- Gross photograph of mucinous carcinoma showing solid areas, with multiple small cysts containing mucinous fluid

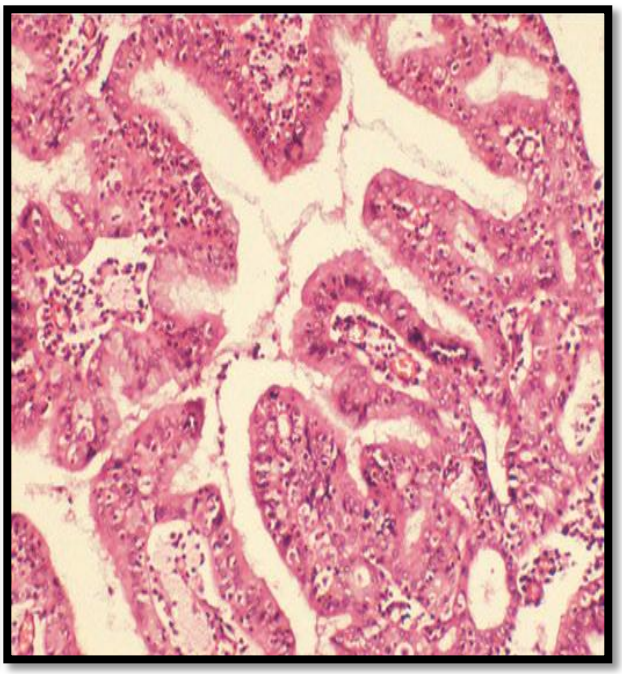


Fig 24- Microphotograph of Mucinous carcinoma showing papillae lined by tall columnar mucin secreting cells having pleomorphic nuclei (H&E, 400X)

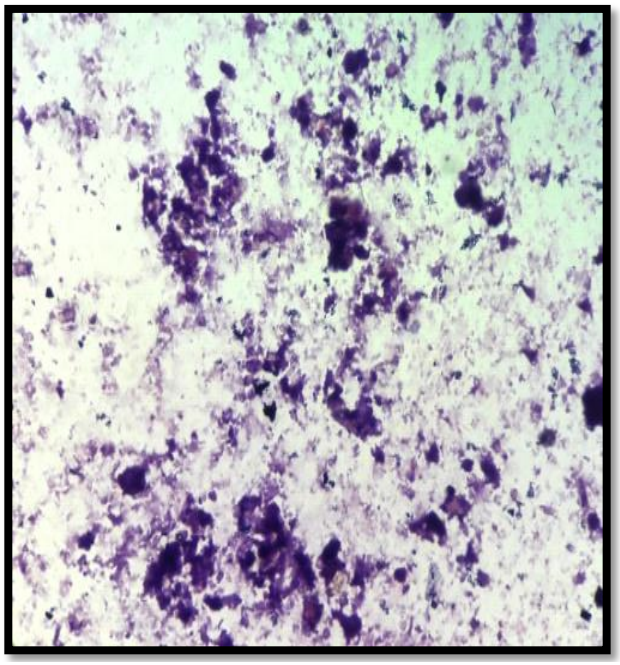


Fig 25- Imprint smear of mucinous carcinoma showing showing moderate cellularity comprised of pleomorphic tumour cells in a necrotic background (H&E, 100X)

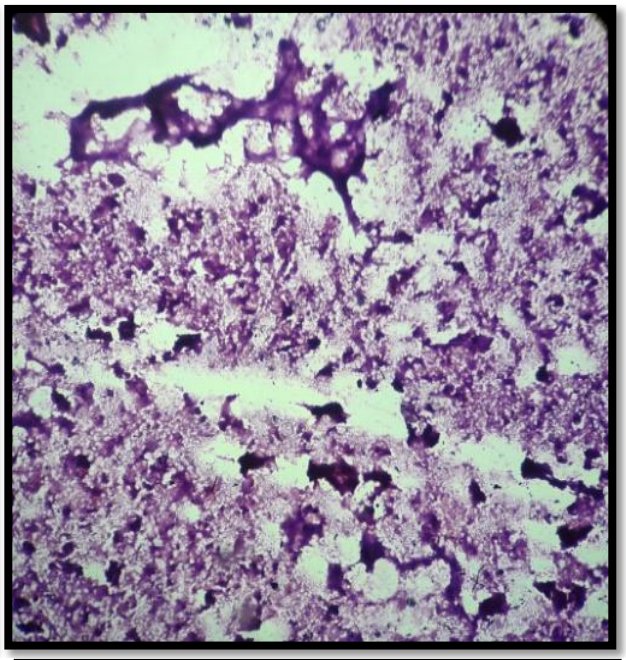


Fig 26- Scrape smear of mucinous carcinoma showing showing moderate to high cellularity comprised of pleomorphic tumour cells in a necrotic background (H&E, 100X)

Fig 27- Gross photograph of Endometrioid carcinoma showing predominantly solid tumour with foci of necrosis

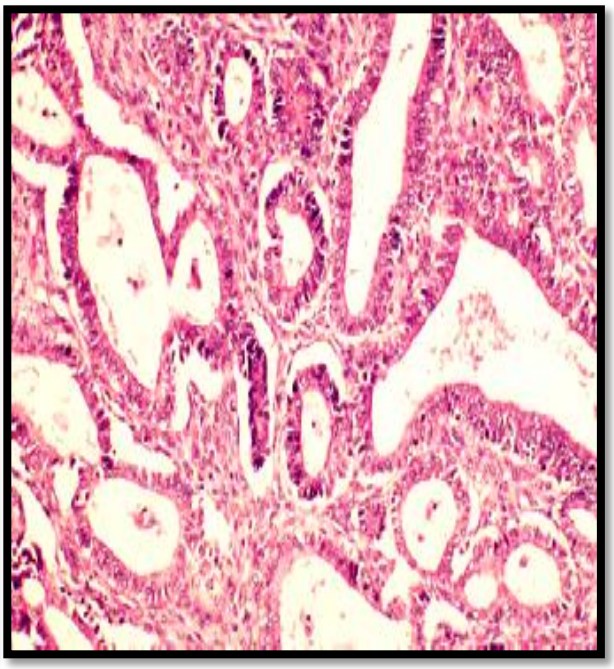


Fig 28- Microphotograph of endometrioid carcinoma showing glands lined by moderately pleomorphic columnar cells with prominent nucleoli (H&E, 400X)

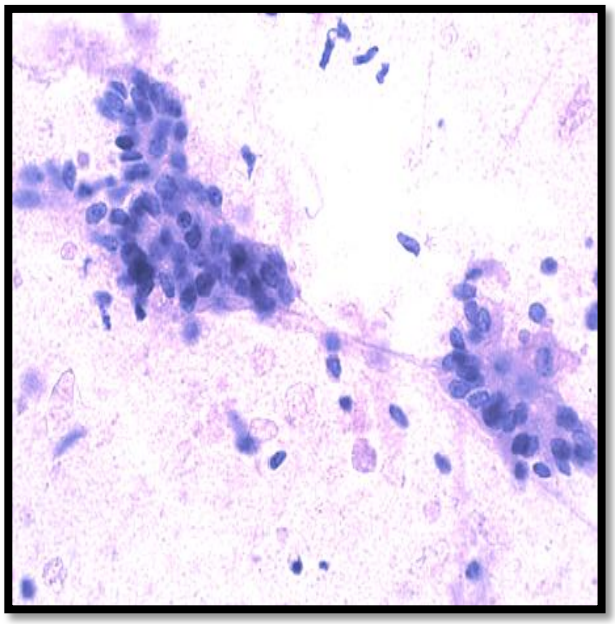


Fig 29- Imprint smear of endometrioid carcinoma showing moderate cellularity comprised of pleomorphic columnar cells arranged in clusters and acinar pattern (H&E, 400X)

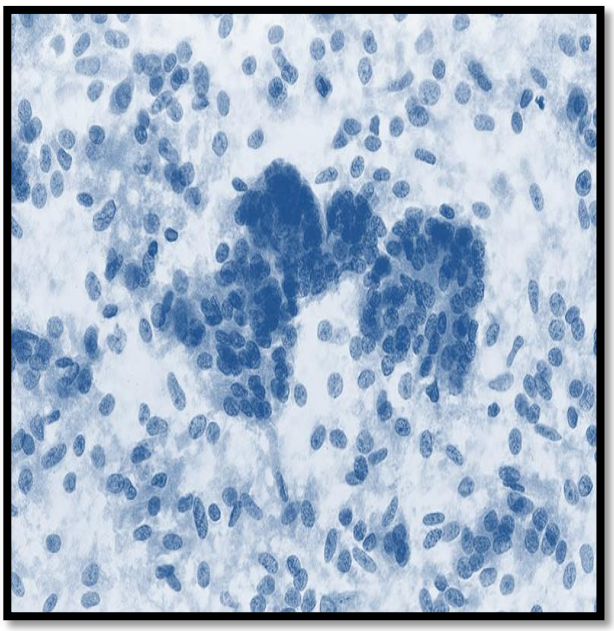


Fig 30- Scrape smear of endometrioid carcinoma showing high cellularity comprised of pleomorphic columnar cells arranged in glandular pattern, clusters and singly scattered (H&E, 400X)

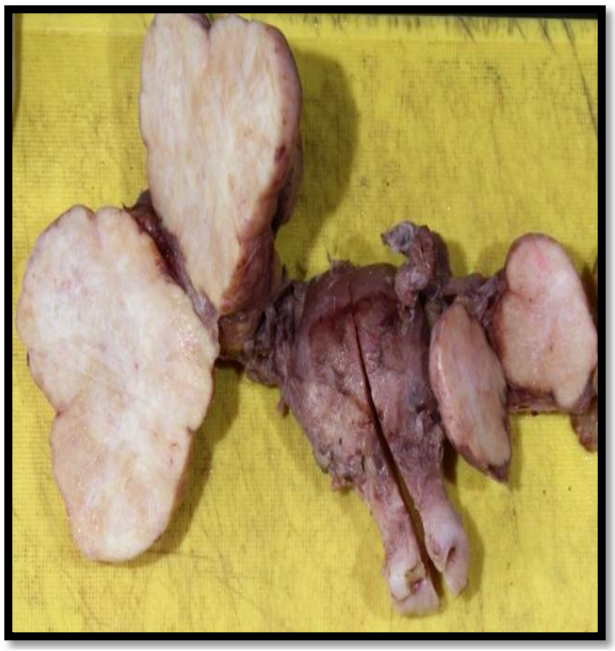


Fig 31- Gross photograph of Benign brenner tumour cut section showing completely solid tumour with solid, grey white appearance

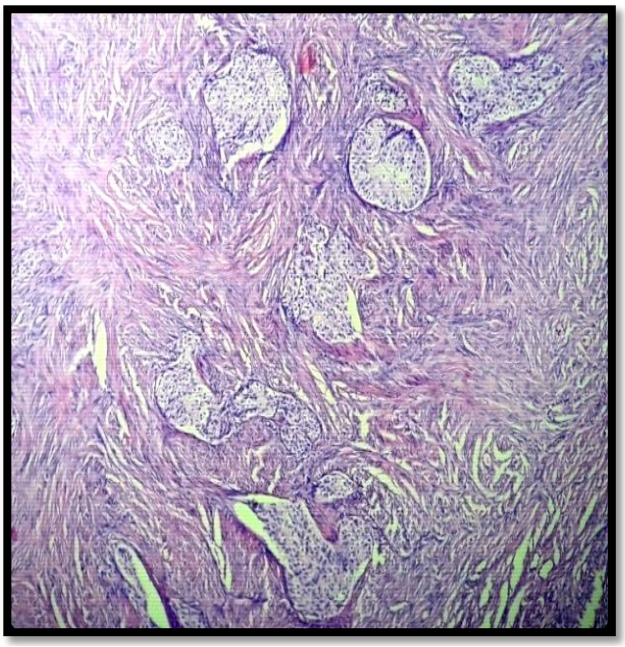


Fig 32- Microphotograph of Benign brenner tumour with central nests of transitional cells having abundant clear cytoplasm (H&E, 400X)

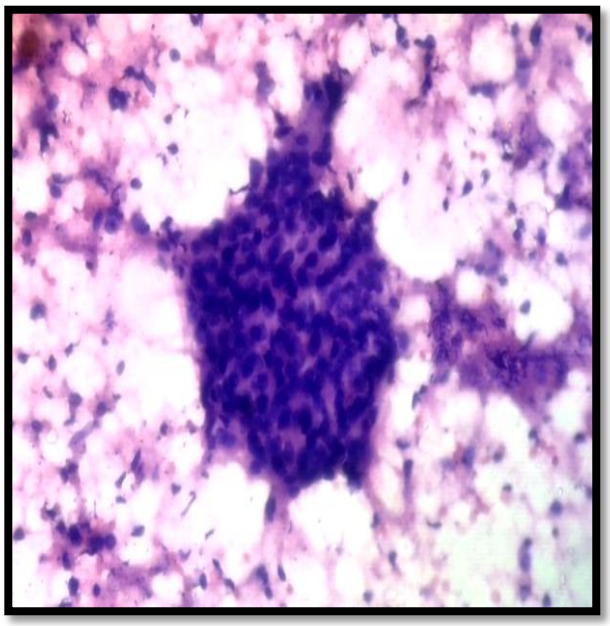


Fig 33- Imprint smear of Benign brenner tumour showing moderate cellularity comprised of round to oval cells (H&E, 400X)

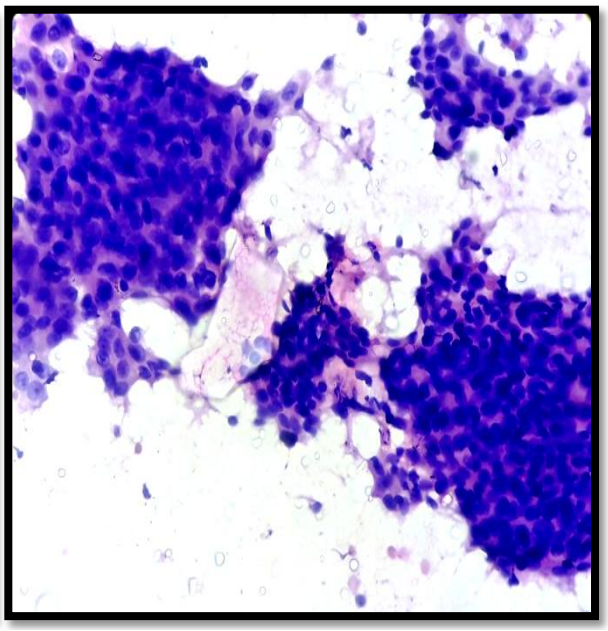


Fig 34- Scrape smear of Benign brenner tumour showing high cellularity comprised of round to oval cells (H&E, 400X)

Fig 35- Gross photograph of fibroma showing solid, glistening and whorled appearance on cut surface

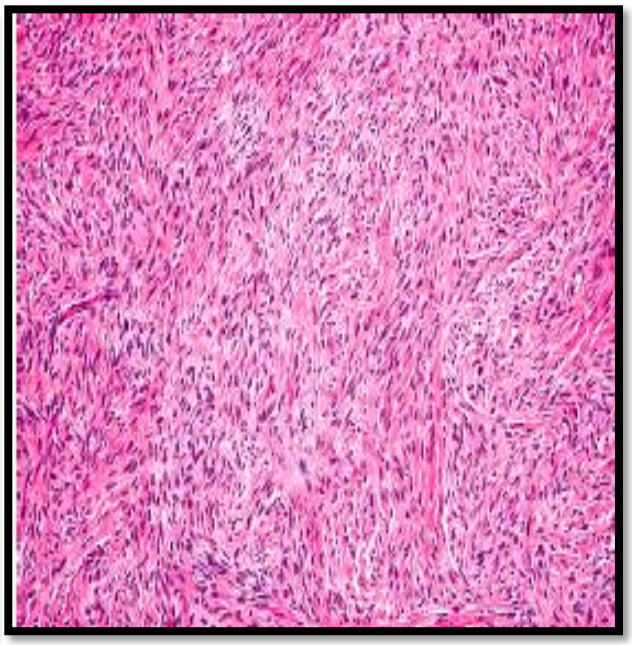


Fig 36- Microphotograph of fibroma showing storiform pattern of tumour cells with spindle shaped cells (H&E, 400X)

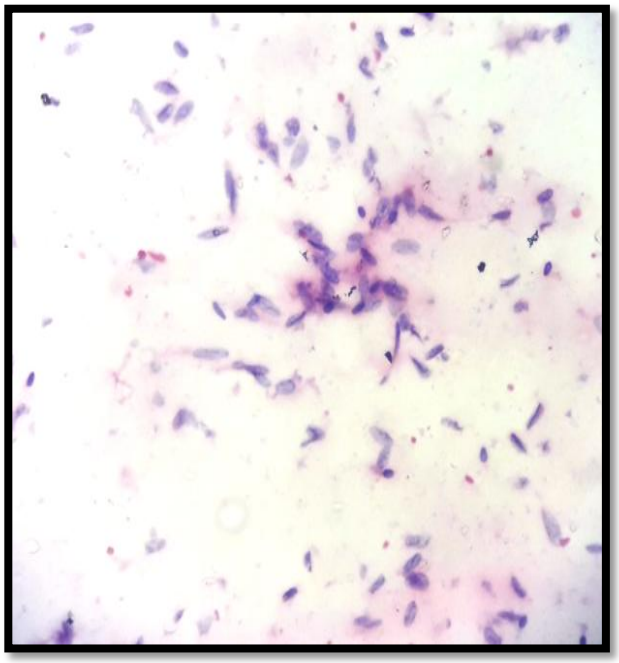


Fig 37- Imprint smear of fibroma showing low cellularity comprised of singly scattered spindle cells (H &E, 400X)

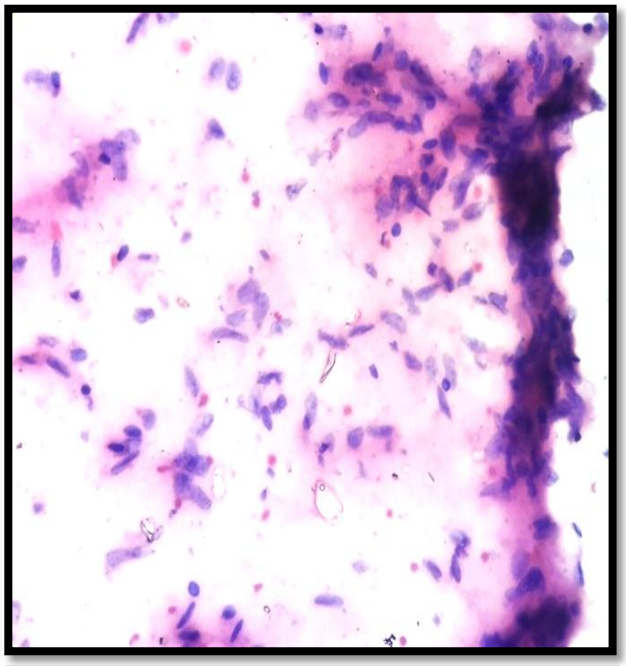


Fig 38- Scrape smear of fibroma showing moderate cellularity comprised of clusters and singly scattered spindle cells (H&E, 400X)

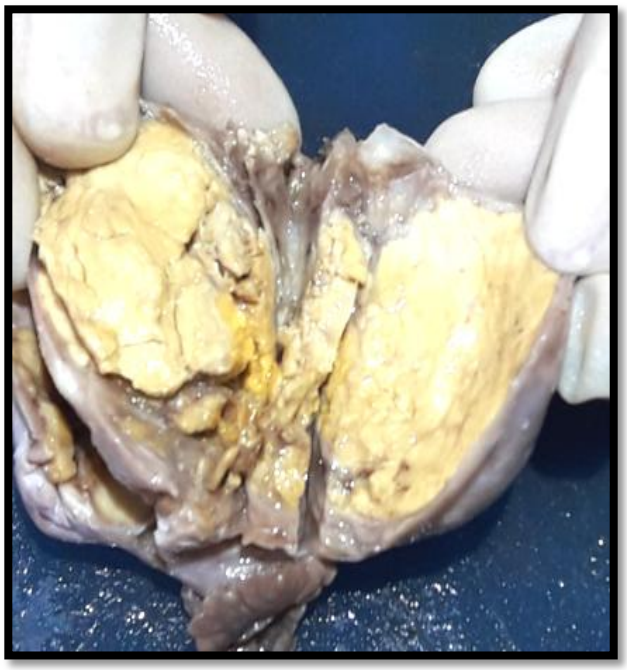


Fig 39- Gross photograph of Steroid cell tumour cut section showing a predominantly solid, yellowish appearance.

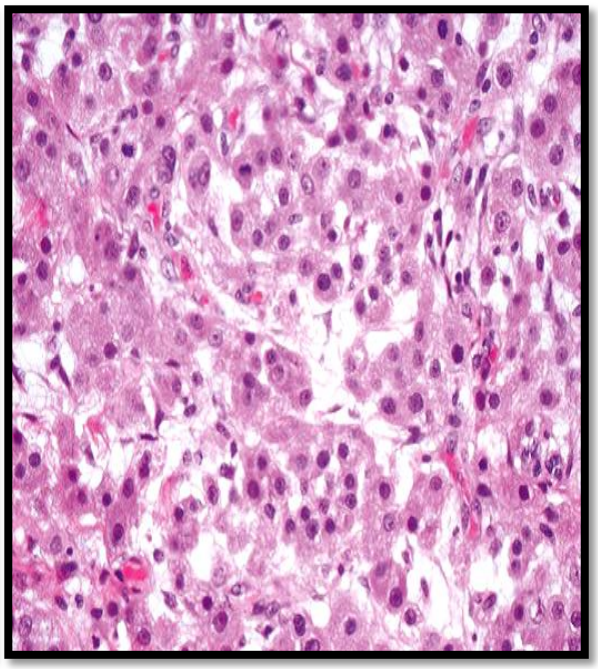


Fig 40- Microphotograph of steroid cell tumour showing polygonal cells with round to oval vesicular nuclei, prominent nucleoli and abundant clear to eosinophilic cytoplasm (H&E, 400X)

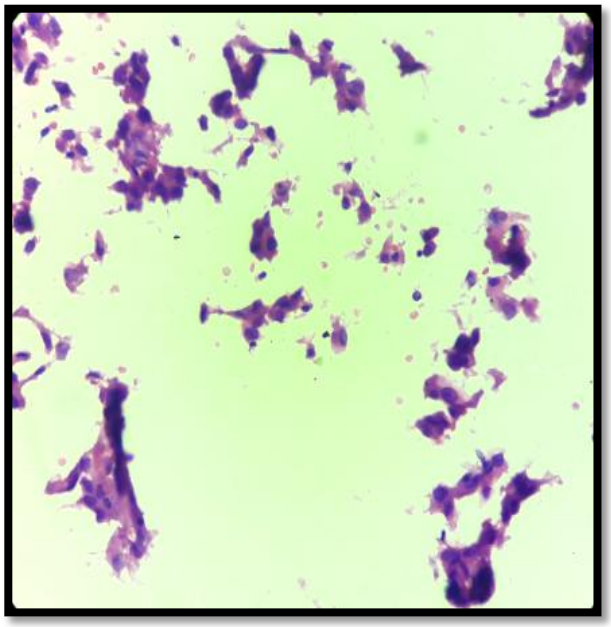


Fig 41- Imprint smear of Steroid cell tumour showing moderate cellularity comprised of polygonal cells having abundant cytoplasm (H&E, 400X)

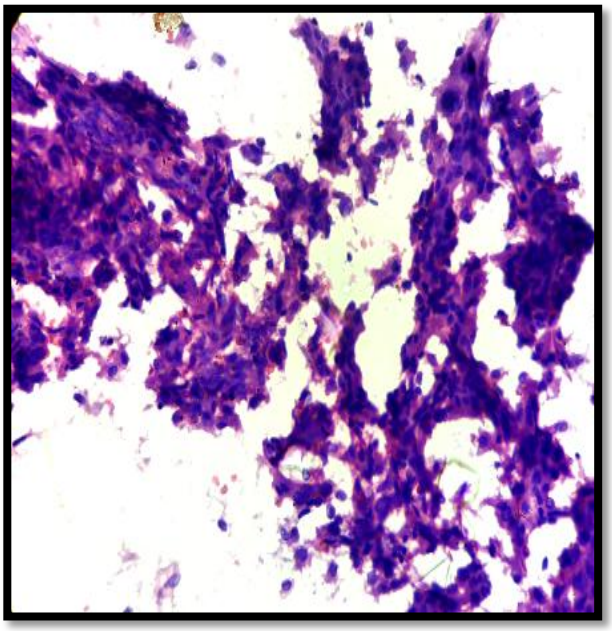


Fig 42- Scrape smear of Steroid cell tumour showing high cellularity comprised of polygonal cells with crisp nuclear chromatin having abundant cytoplasm (H&E, 400X)

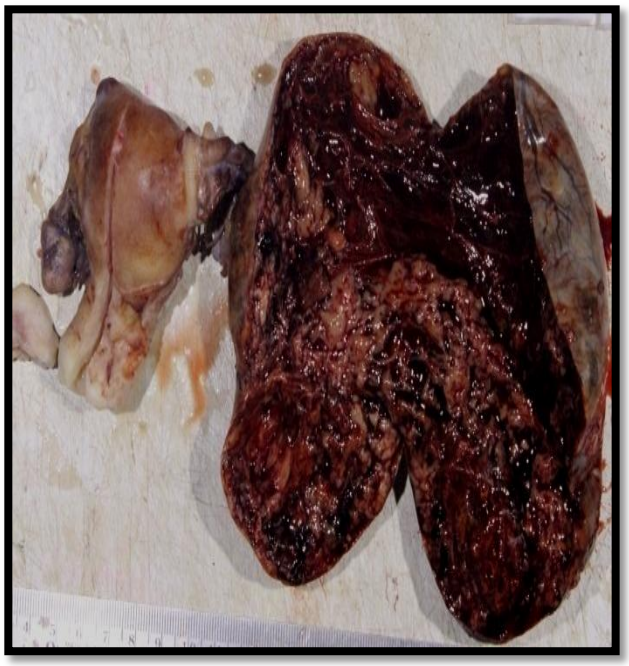


Fig 43- Gross photograph of granulosa cell tumour showing predominantly cystic appearance with focal solid brownish areas

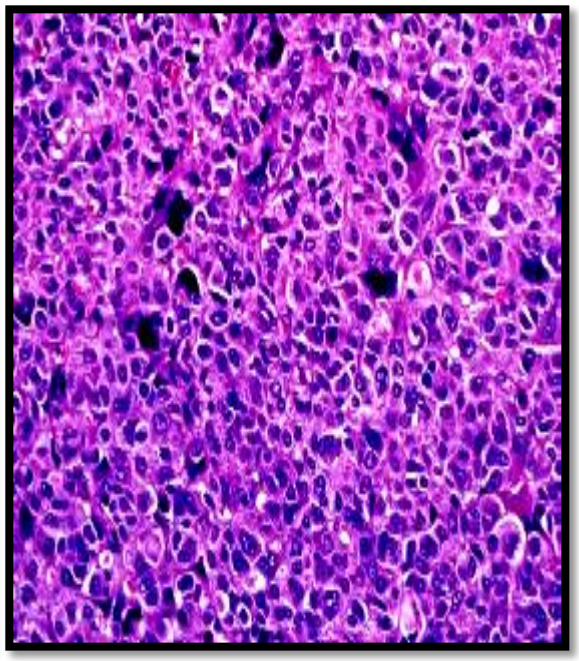


Fig 44- Microphotograph of granulosa cell tumour showing diffuse sheets of round to oval tumour cells having nuclear grooves (H&E, 400X)

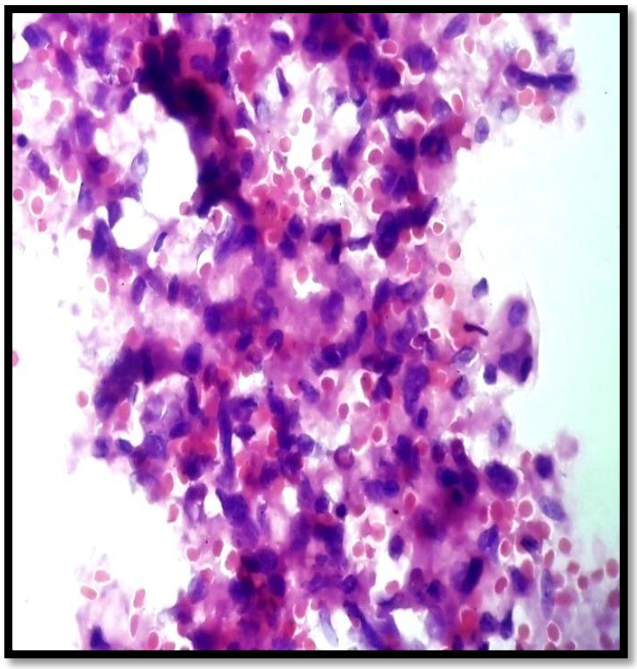


Fig 45- Imprint smear of granulosa cell tumour consisting of tumour cells arranged in clusters having round to oval nuclei with moderate eosinophilic cytoplasm (H&E, 400X)

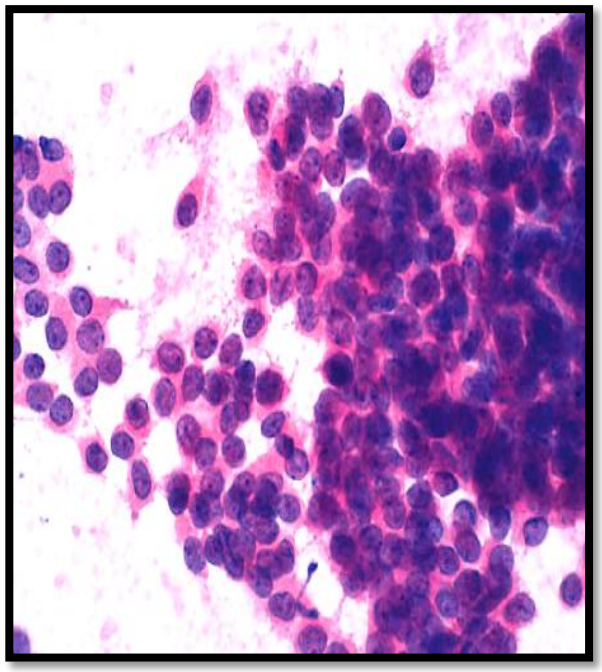


Fig 46- Scrape smear of granulosa cell tumour consisting of sheets of monomorphic tumour cells showing nuclear grooves with moderate eosinophilic cytoplasm (H&E, 400X)

Fig 47- Gross photograph of Sex cord tumour with annular tubules showing solid grey appearance with focal slit like spaces

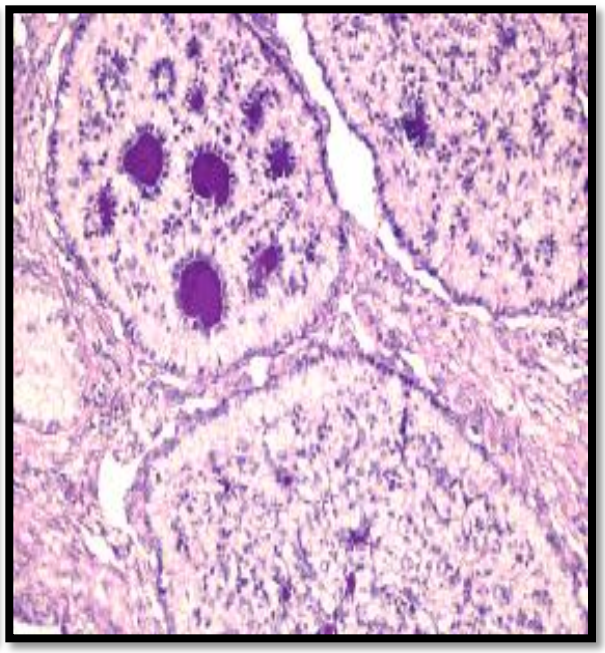


Fig 48- Microphotograph of Sex cord tumour with annular tubules showing complex tubular structure with a central hyaline body and palisading cells (H&E, 400X)

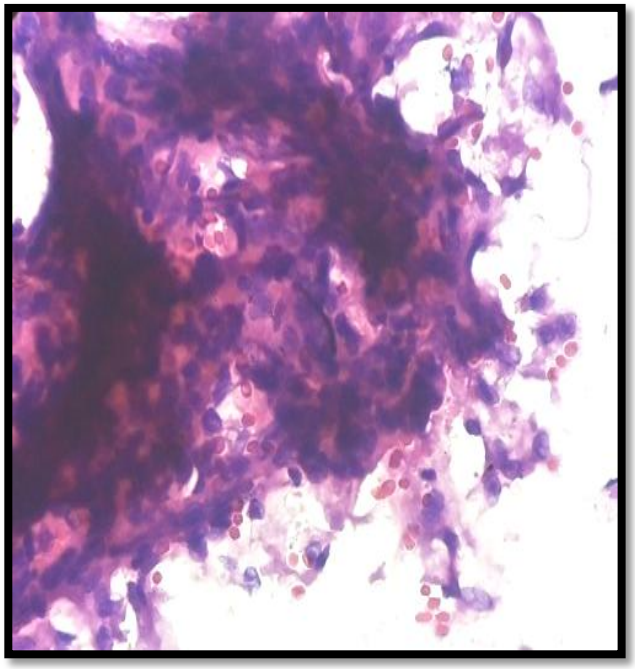


Fig 49- Imprint smear of Sex cord tumour showing moderate cellularity comprised of cohesive clusters of uniform cells having round to oval hyperchromatic nuclei (H&E, 400X)

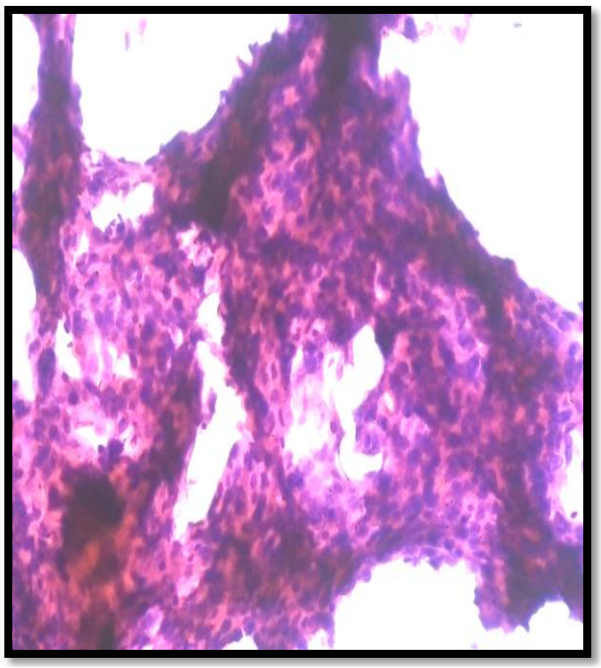


Fig 50- Scrape smear of Sex cord tumour showing moderate to high cellularity comprised of cohesive clusters and sheets of uniform cells having round to oval hyperchromatic nuclei (H&E, 400X)

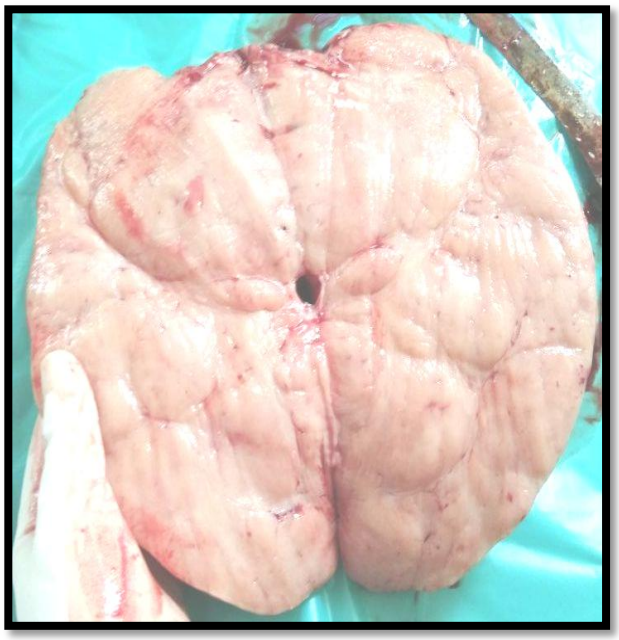


Fig 51- Gross photograph of Dysgerminoma showing completely solid, homogenous, lobulated pale white appearance

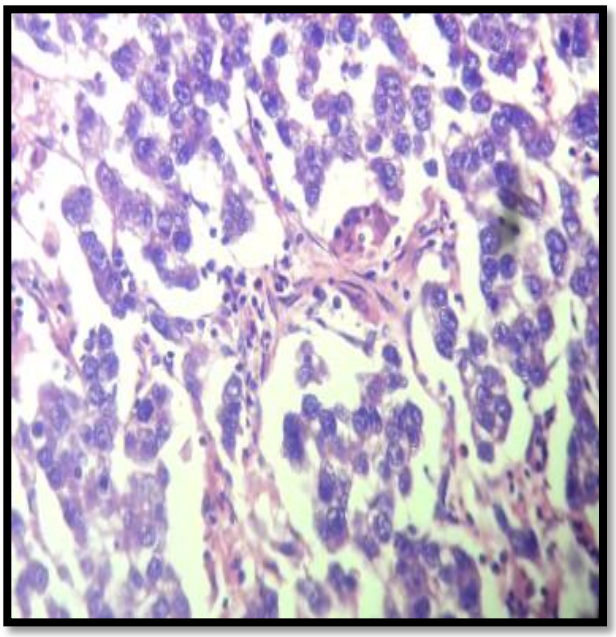


Fig 52- Microphotograph of Dysgerminoma showing nests and sheets of tumour cells separated by fibrous septa containing lymphocytes (H&E, 400X)

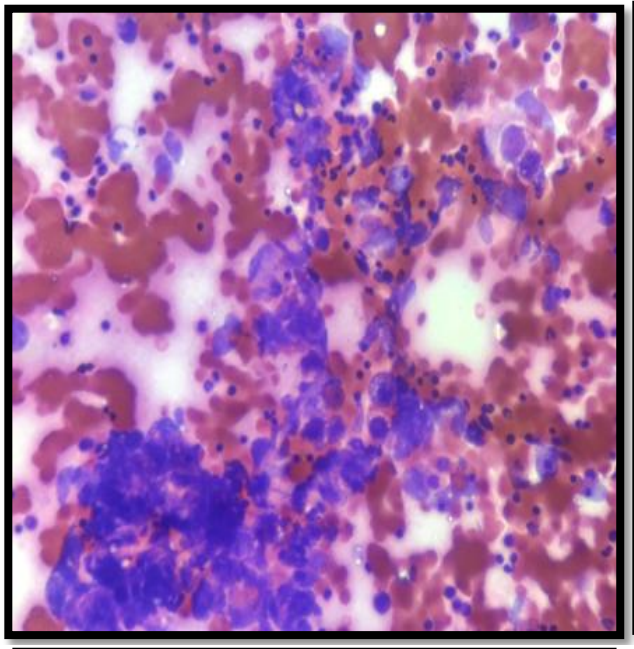


Fig 53- Imprint smear of Dysgerminoma showing discrete tumour cells with interspersed lymphocytes in a hemorrhagic background (PAP, 400X)

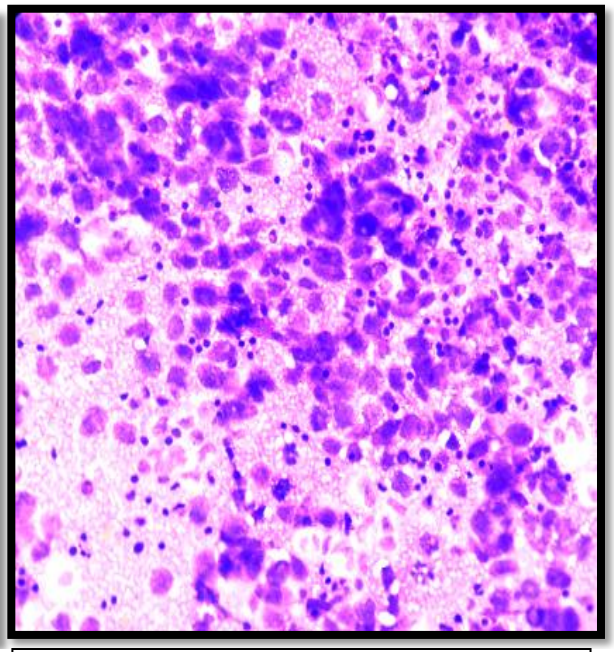


Fig 54- Scrape smear of Dysgerminoma showing discrete monomorphic tumour cells with interspersed lymphocytes (PAP, 400X)

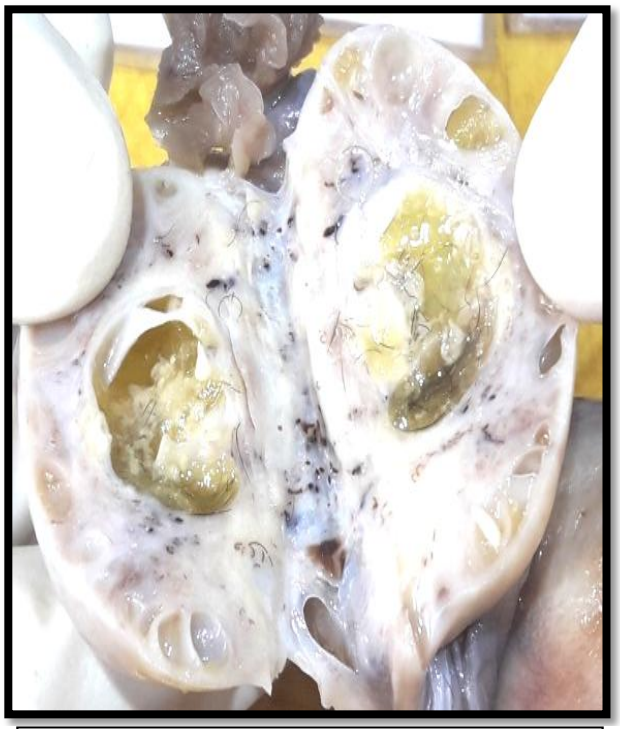


Fig 55- Gross photograph of Mature teratoma: showing variegated appearance

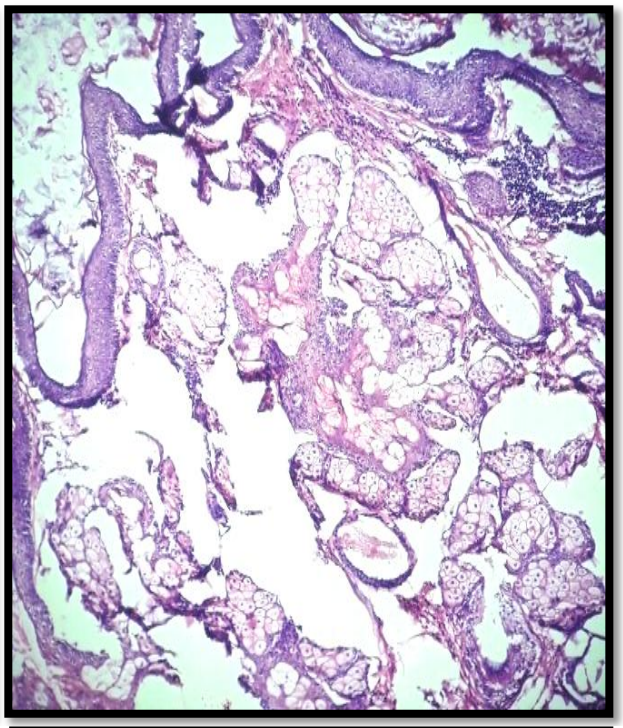


Fig 56- Microphotograph of Mature teratoma showing stratified squamous epithelium with skin adnexal structures (H&E, 400X)

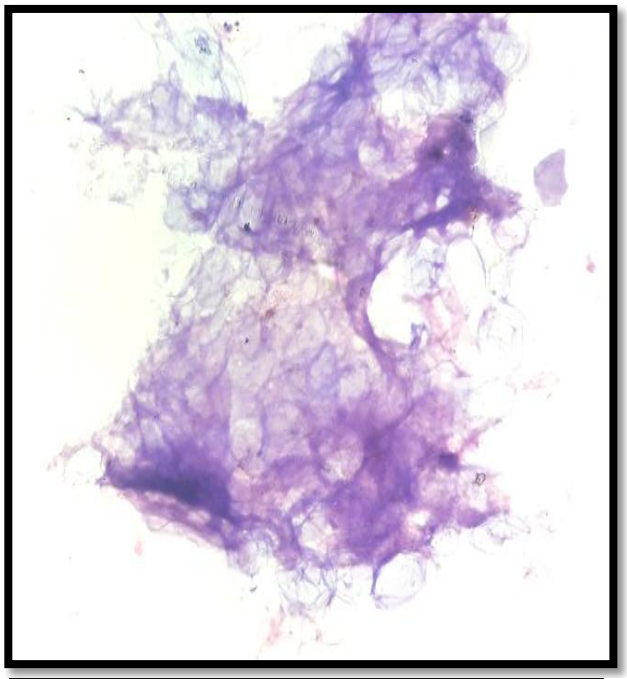


Fig 57- Imprint smear of Mature teratoma showing anucleated squamous cells (H&E, 400X)

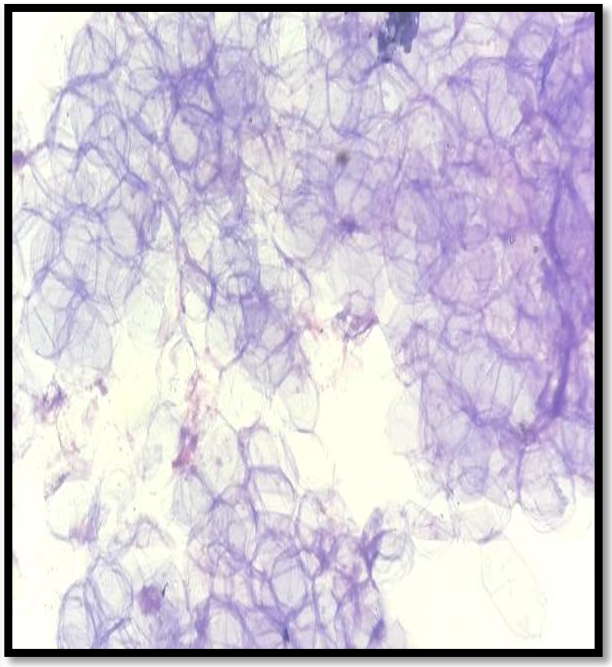


Fig 58- Scrape smear of Mature teratoma showing anucleated squamous cells (H&E, 400X)

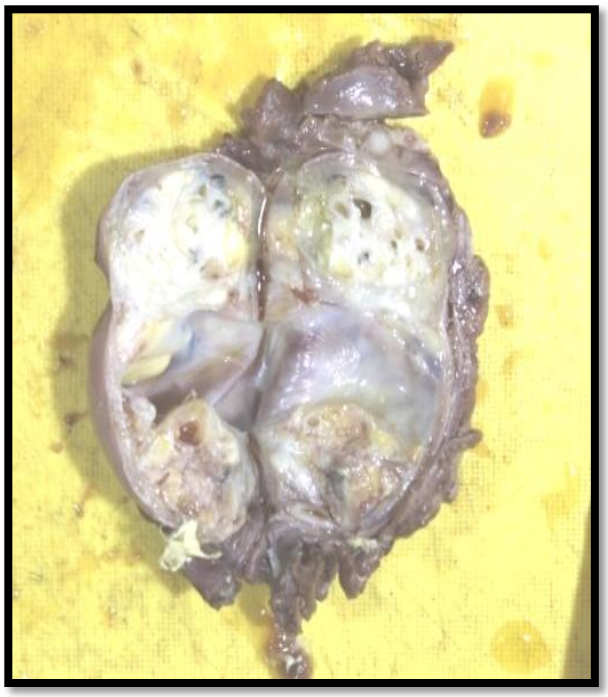


Fig 59- Gross photograph of Mixed germ cell tumour showing variegated appearance with areas of hemorrhage and necrosis

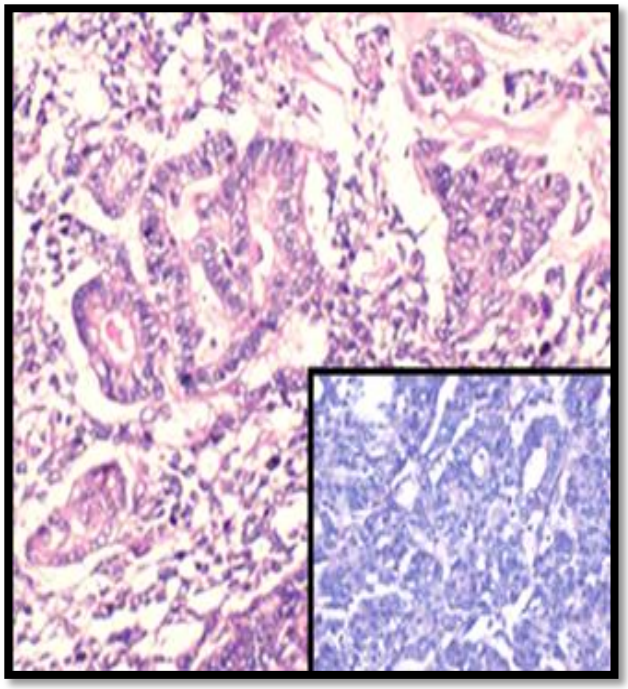


Fig 60- Microphotograph of Mixed germ cell tumour showing loose reticulated pattern with schiller duval bodies (H&E, 400X). Inset showing sheets of tumour cells with occasional ill formed glands (H&E, 400X).

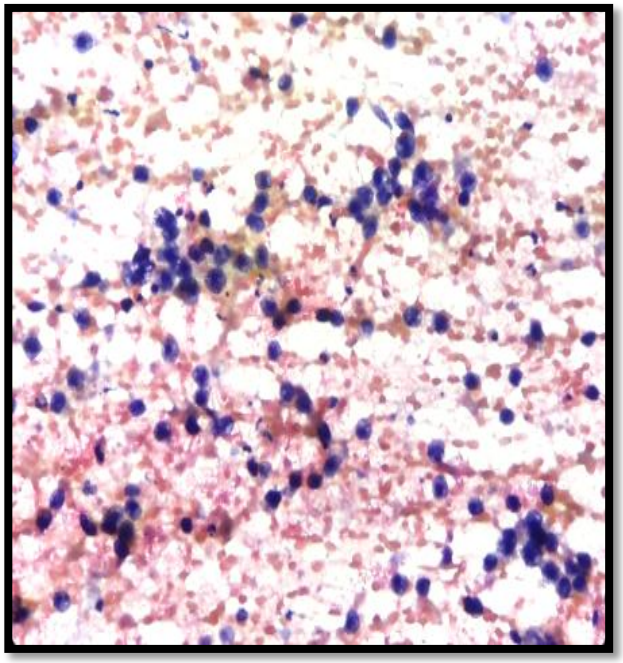


Fig 61- Imprint smear of Mixed germ cell tumour showing loosely cohesive clusters and scattered cells in a hemorrhagic background (H&E, 400X)

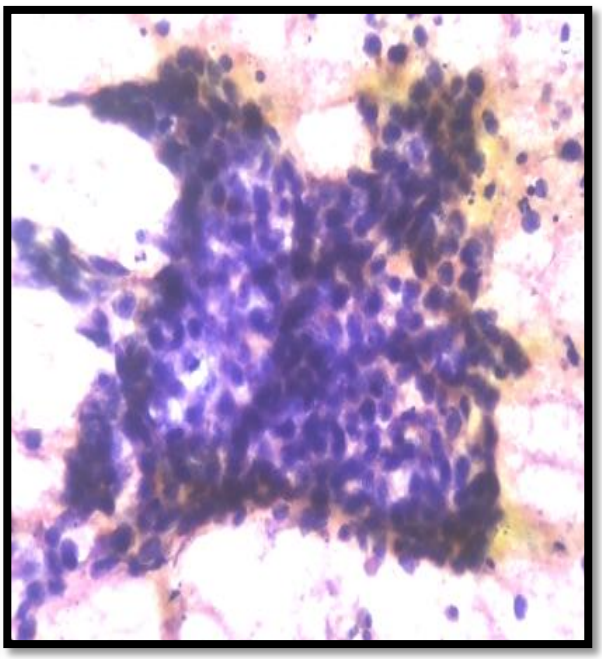


Fig 62- Scrape smear of Mixed germ cell tumour showing clusters and scattered cells having round to oal nuclei with prominent nucleoli (H&E, 400X)

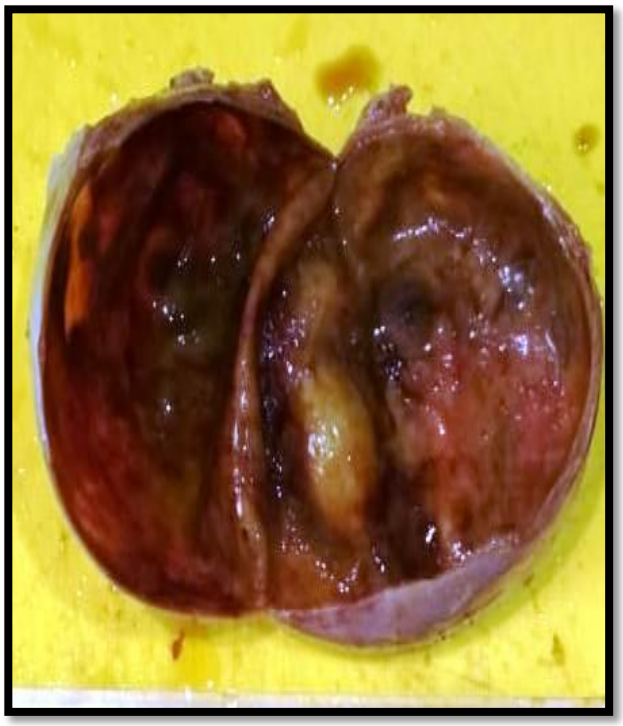


Fig 63-Gross photograph of endometriotic cyst showing large areas of hemorrhage

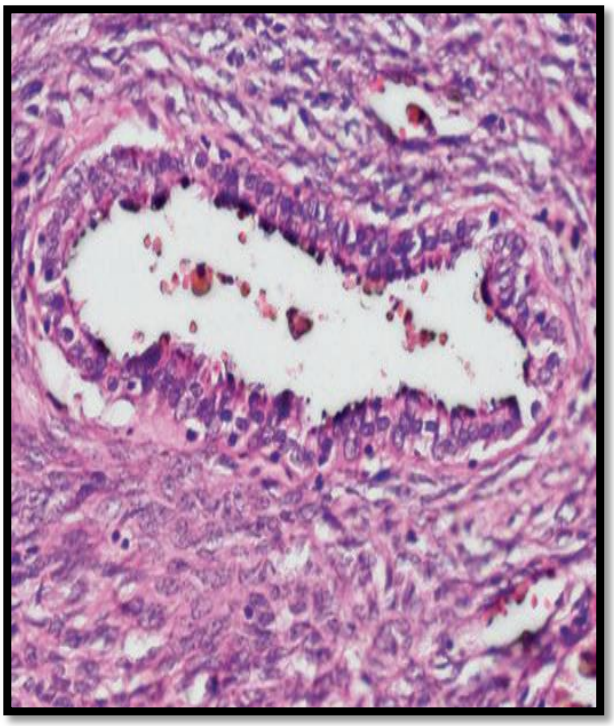


Fig 64 - Microphotograph of endometriotic cyst of ovary showing endometrial glands and hemosiderin laden macrophages (H&E, 400X)

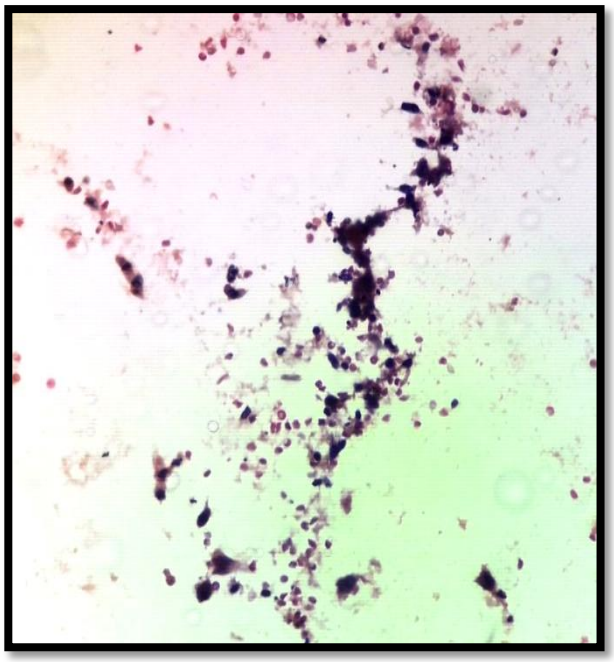


Fig 65-Imprint smear of endometriotic cyst showing scattered hemosiderin laden macrophages in a hemorrhagic background (H&E, 100X)

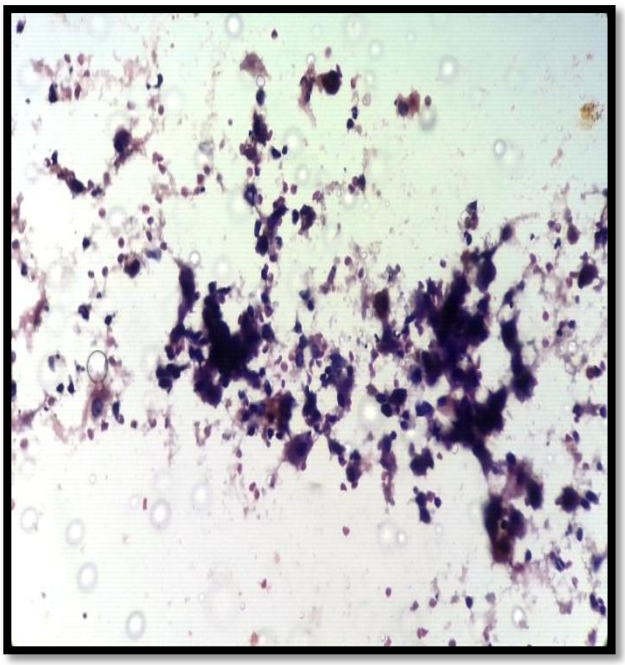


Fig 66- Scrape smear of endometriotic cyst showing scattered hemosiderin laden macrophages in a hemorrhagic background (H&E, 100X)

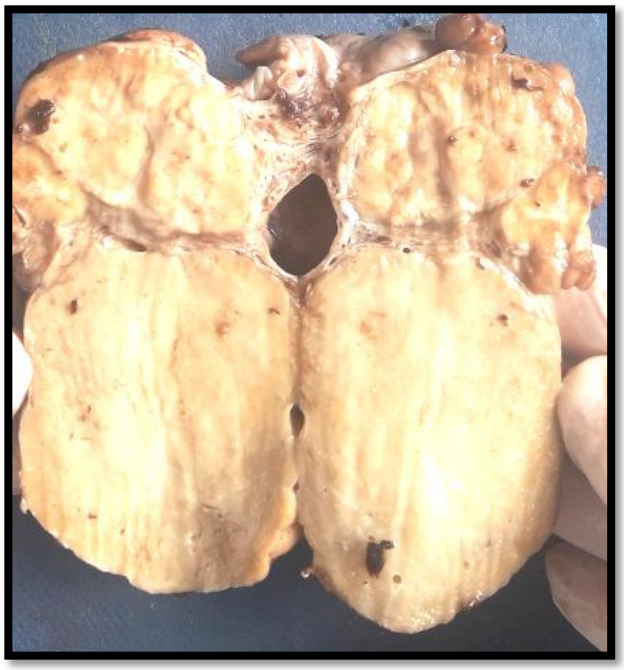


Fig 67- Gross photograph of Pregnancy luteoma showing solid, homogenous, pale yellow appearance

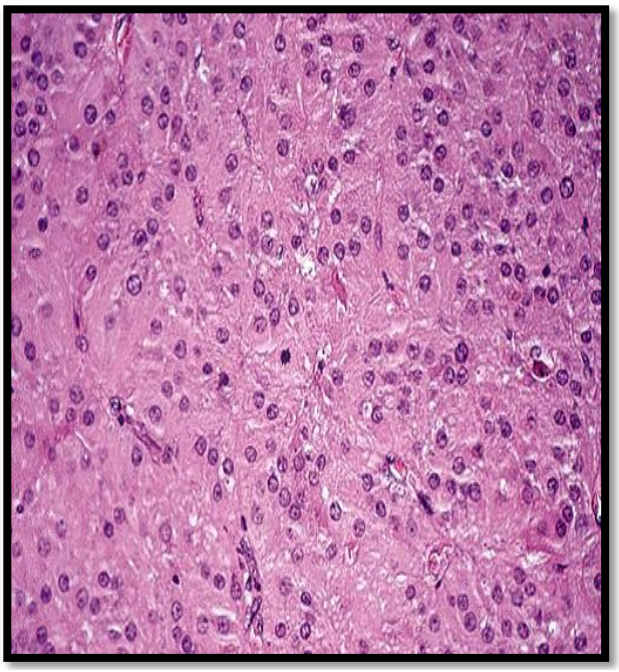


Fig 68- Microphotograph of pregnancy luteoma containing diffuse sheets of cells with abundant eosinophilic cytoplasm, central round nuclei, and occasional mitosis (H&E, 400X)

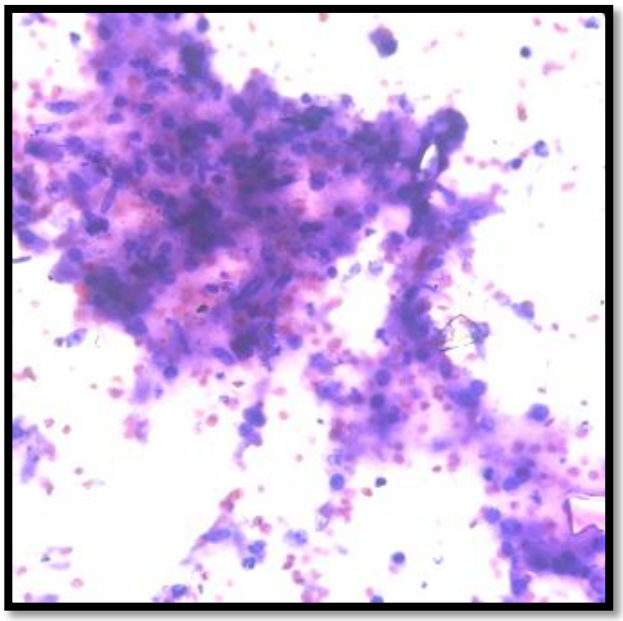


Fig 69- Imprint smear of pregnancy luteoma showing cells in sheets and clusters comprised of round to oval cells with hazy nuclear chromatin and abundant eosinophilic cytoplasm (H&E, 400X)

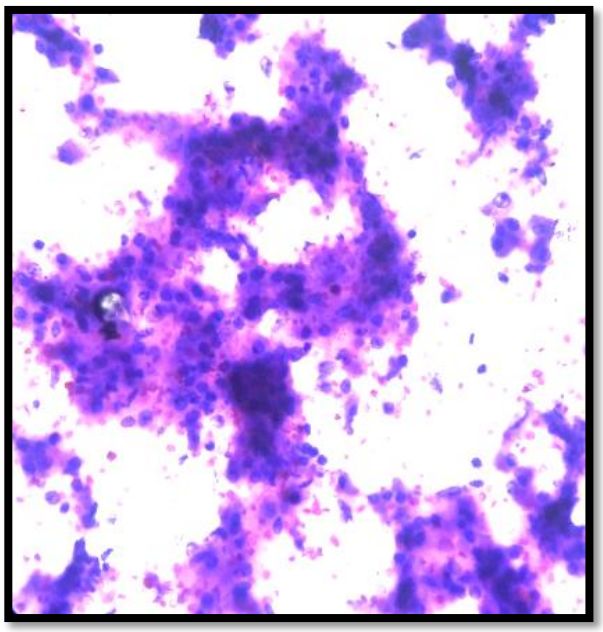


Fig 70- Scrape smear of pregnancy luteoma showing cells in sheets and clusters comprised of round to oval cells with crisp nuclear chromatin and abundant eosinophilic cytoplasm (H&E, 400X)

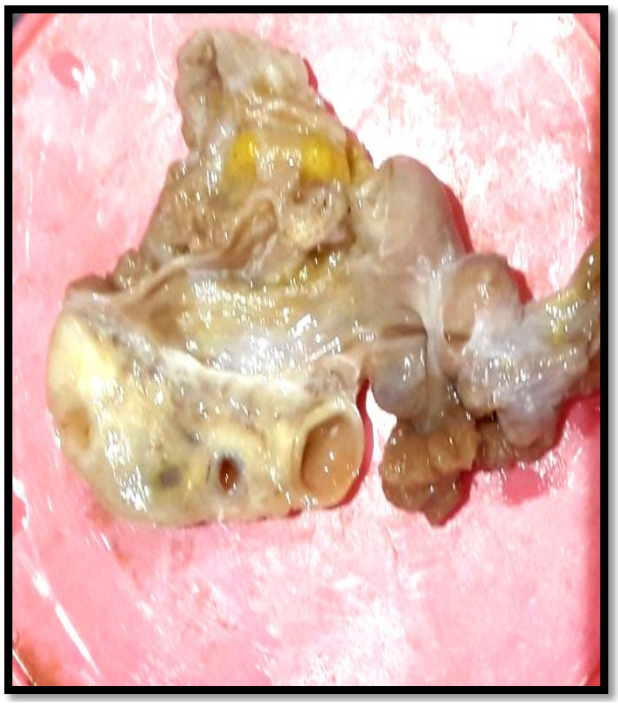


Fig 71- Gross photograph showing focal pale white solid areas.

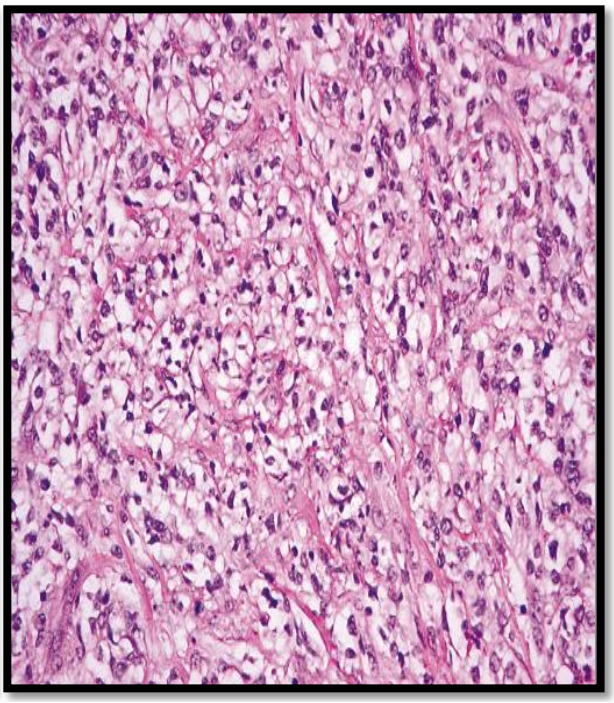


Fig 72- Microphotograph of Non Hodgkin lymphoma showing monomorphic population of round cells having pleomorphic nuclei and scant cytoplasm (H&E, 400X)

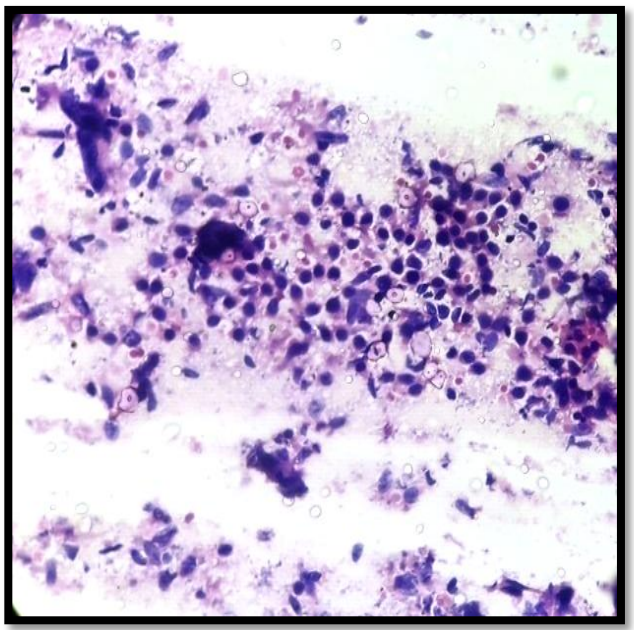


Fig 73- Imprint smear of Non Hodgkin lymphoma showing moderate cellularity comprised of large, round cells with hyperchromatic nuclei and scant cytoplasm (H&E, 400X)

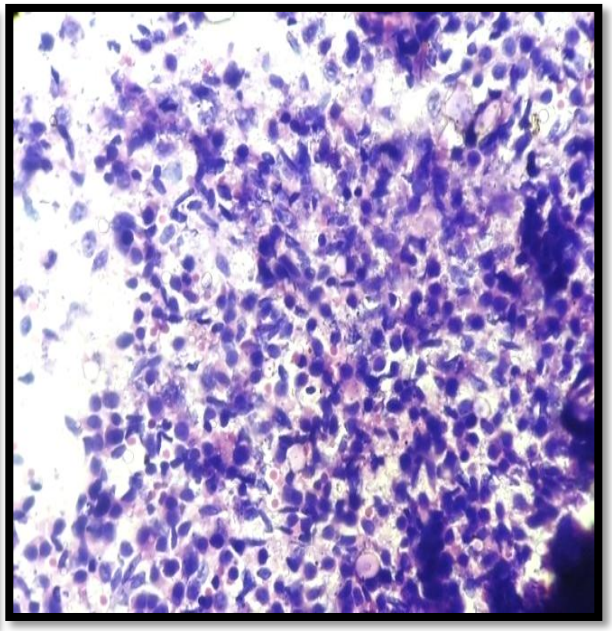


Fig 74- Scrape smear of Non Hodgkin lymphoma showing high cellularity comprised of large, round cells with hyperchromatic nuclei and scant cytoplasm (H&E, 400X)

DISCUSSION

Intraoperative imprint and scrape cytology for diagnosis of tumour and tumour like lesions of ovary is a rapid diagnostic investigation and is quite beneficial as it helps the surgeon to plan the treatment so that undertreatment or overtreatment of the patients can be avoided. [21]

In the present study, imprint and scrape cytology of 110 cases of tumour and tumour like lesions of ovary were analyzed and correlation with histopathological study was done in all cases.

Age group of patients in this study varied from 6 to 75years with a mean age of 40.5years. Most of the cases were in the age group of 21- 40 years (60%). Similar observations were observed in study done by Riaz A *et al*[3], Das C *et al*[4], Jain R *et al*[5] and Vijayakumar A *et al*.[8]

Table 17:Comparison of Age range and Mean age in different studies and the present study

Authors	**Age Range (yrs)**	**Mean age (yrs)**
Riaz A *et al*[3]	10-70	40
Das C *et al*[4]	5-62	41
Jain R *et al*[5]	12-64	44
Vijayakumar A *et al*[8]	2-65	42
Shahid M *et al*[14]	14-68	41.5
Present study	6-75	40.5

In present study, cellularity was better in scrape smear amounting to high cellularity in 36.5% cases. However, high cellularity was noted in 4.5% cases on imprint smear. Similar findings were observed by Jain R *et al*[5] and Bohara *et al* [16] who noticed that cellularity was found to be better with scrape smears than imprint smears.

Comparison of the architectural pattern of imprint and scrape smears showed that in imprint smears the cells were singly scattered in 61% cases, arranged in clusters in 29% cases, diffuse sheets in 7% cases, in 1% papillary pattern and 2% cases showed glandular pattern. Whereas architectural pattern was better appreciated in scrape smears with 62.8% cases showing cells arranged in clusters, followed by diffuse sheets (22.7%), papillary pattern (4.5%), glandular pattern (3.6%) and singly scattered cells(1%). Our findings were similar to the study done by Rao S *et al*[7] and Bohara *et al*.[16]

Crispness of the nuclear chromatin of the cells was more evident in scrape smears when compared to imprint smears. Nuclear chromatin was crisp in 91% cases in imprint smears while in scrape smears 92.7%cases showed crisp nuclear chromatin. Hazy nuclear chromatin was seen in 9% and 7.3% cases in imprint and scrape smears respectively. Similar observations were obtained by Sardar K *et al*[6] and Bohara *et al*.[16]

Cytoplasmic staining was found to be superior in scrape smears as compared to imprint smears. Unsatisfactory staining of smears was seen 11% cases in imprint smears which was more when compared to scrape smears that showed only 4.5% cases showing unsatisfactory staining. This was comparable to the study done by Kolte S *et al*.[9]

Background was clear in 2% cases in imprint smears and 9%cases in scrape smears while it was hemorrhagic/necrotic in 61% cases in imprint smears and 42.7% cases in scrape smears. These findings were similar to the observations done by Rao S *et al*[6] and Bohara *et al*.[16]

In the present study, the overall cumulative scores of imprint and scrape smears showed highly significant statistical difference with respect to cellularity and architectural pattern with a p value of less than 0.0001 each. Whereas the nuclear features, cytoplasmic staining and background features showed no significant statistical difference. Study done on intraoperative evaluation of ovarian tumours by Sardar K *et al*[6] supported our findings.

Blumenfeld *et al*[24] did a comparative study of imprint, scrape cytology and FNAC of breast, lung and colon tumours. They concluded that scrape preparations yield high cellularity as compared to imprint preparations and FNAC. The most important qualitative difference that they found was that scrape preparations, besides being more cellular, were more apt to exhibit wider variability in the size of the cellular clusters as compared to the other two methods. In present study also cytomorphology was better on scrape as compared to imprint.

Khunamornpong *et al*[19] described that scrape cytology can be used in diagnosis of tumour and concluded that scrape technique is the method preferred over other cytological diagnostic techniques as the cellularity is high and one can obtain excellent cellular details. These findings are similar to the present study.

In the present study, the tumour and tumour like lesions of ovary were graded according to the final histopathological diagnosis as benign, borderline and malignant. Out of total 110cases studied, 80(72.7%) cases were reported as benign, 7(6.4%)cases as borderline, 13(11.8%) cases as malignant and 10(9.1%) cases as tumour like lesions of ovary. Various studies done by Riaz A *et al*[3], Das C *et al*[4], Jain R *et al*[5], Sardar K *et al*[6] and Carmen *et al*[11] got similar findings.

Table18: Histopathological categorization of tumours in various studies and present study

	Benign (%)	Malignant (%)	Borderline (%)
Riaz A *et al*[3]	51.6	41.6	6.6
Das C *et al*[4]	32	66	2
Sardar K *et al*[6]	61	32	7
Carmen *et al*[11]	79.5	14.5	6
Present study	80	13	7

In the present study, out of 110 cases studied, 93 cases (84.5%) showed correlation with histopathology diagnosis. 17 cases (15.5%) which showed discordance were mostly tumour like lesions and borderline tumours. Similar findings were found in a study done by Annapoorna *et al.*[15] These authors mentioned that insufficient sampling of representative areas may be the reason in these cases. Similar explanation holds true in present study also.

In the present study, out of 10 tumour like lesions of ovary, 7 cases of endometriotic cyst were diagnosed as hemorrhagic cyst on cytology whereas it was diagnosed correctly on histopathology. This was because of absence of endometrial cells or stroma or hemosiderin laden macrophages on cytology smears. These findings were similar to the study done by Kar Tushar et al.[22]

In the present study, 6 cases of mucinous borderline tumors and 1 case of serous borderline tumour was reported on cytology as benign mucinous cystadenomas and benign serous cystadenoma respectively. Similar findings were reported by Khunamornpong *et al*[9] and Riaz *et al* [3] who explained that it was because of mild nuclear atypia and and epithelial crowding which was present focally on cytology smears whereas on histopathology nuclear atypia along with stratification can be appreciated clearly.

In the present study benign serous cystadenoma was the commonest lesion encountered amounting to 30%cases. Similar findings were reported by Riaz *et al*[3], Jain R *et al*[5] , Sardar K *et al*[6] and Carmen *et al*[11].

In the present study, all malignant cases reported as serous, mucinous and Endometrioid carcinoma on imprint and scrape cytology were correlated with histopathological diagnosis. Although, sometimes endometrioid carcinoma show cytological features overlapping with serous carcinoma, but in our study we had only 1 case of Endometrioid carcinoma which was correctly diagnosed on cytology as well as histopathology. Cytology smears of Endometrioid carcinoma showed high cellularity with cells arranged in glandular pattern and papillary fragments at foci.

Tumour cells were pleomorphic, elongated, having high nucleo-cytoplasmic ratio with irregular nuclear membrane and moderate eosinophilic cytoplasm. Background showed necrosis.

In the present study, out of 12 cases of sex cord stromal tumours, 5 cases of granulosa cell tumour and 1 case of steroid cell tumour was correctly diagnosed on cytology and histopathology. Whereas, 3 cases of fibroma and 1 case of fibrothecoma was diagnosed as benign spindle cell tumour on cytology but were correctly diagnosed on histopathology. 1 case of sex cord tumour with annular tubules and 1 case of mixed sex cord stromal tumour was diagnosed as sex cord tumour on cytology. These findings were similar with the study by Vijayakumar A *et al*[8].

In the present study, out of 18 germ cell tumours of ovary, the commonest tumour was mature teratoma followed by dysgerminoma and mixed germ cell tumour. All these cases showed correlation between imprint & scrape cytology and histopathology. Khunamornpong S *et al*[19] also obtained findings comparable to our study. However, 1 case of immature teratoma was misinterpreted as mature teratoma on cytology while it was correctly diagnosed on histopathology as immature teratoma. Similar observation was done by Mahore S *et al*[10] who explained that absence of immature elements on cytology was likely due to improper sampling of the tumour.

In the present study, 1 case of Non Hodgkins lymphoma and 1 case of metastatic invasive lobular carcinoma of breast showed cytological and histopathological correlation.

Jain R *et al* [5] in their study titled as Role of Intraoperative cytology (IOC) in ovarian neoplasms obtained sensitivity, specificity, positive predictive value, negative predictive value, and diagnostic accuracy of 97.7%, 91.3%, 95.5%, 95.6%, and 95.6% respectively. Finally they concluded that diagnostic accuracy of imprint and scrape cytology of ovarian tumours is quite satisfactory.

In the present study, the Sensitivity, Specificity, Positive predictive value and Diagnostic accuracy of overall cytology was 88 %, 98.7%, 91.6% and 91% respectively. These findings were comparable with various other studies done on imprint and scrape cytology of tumour and tumour like lesions of ovary by Bohara *et al*[16], Khan *et al*[17] and Kar T *et al*[22].

SUMMARY

A prospective study of comparison between imprint and scrape cytology was undertaken to evaluate its diagnostic utility by correlating with the histopathological study. This study was carried out for duration of 19 months from 1st December 2017 to 30th June 2019 in the Department of Pathology, B.L.D.E (DEEMED TO BE) University, Shri B M Patil Medical College, Hospital & Research Centre,Vijayapura.

The present study included 110 cases of tumour and tumour like lesions of ovary as per the inclusion and exclusion criteria. The mean age of the patients was 40.5 years with most patients in the age group between 21- 40 years. Majority of the cases were partly solid and partly cystic accounting for 60% of all cases.

Out of 110 ovarian tumours and tumour like lesions studied, 93 cases showed correlation with the histopathological findings.

Out of 110 cases, on scrape smear cytology 101 were reported as tumours of ovary and 8 cases were reported as tumour like lesions of ovary. On imprint smear cytology, 93 were reported as tumours of ovary and 7 cases were reported as tumour like lesions of ovary.

In Imprint smears, cytological diagnosis was not possible in 10 cases (9%) whereas in scrape smear only 1 case was reported as inconclusive.

By both imprint and scrape smear cytology technique, common lesions diagnosed were serous cystadenoma(30%) followed by mucinous cystadenoma(20.9%), mature teratoma(11.8%), hemorrhagic cyst(7.2%), granulosa cell tumour(4.5%), dysgerminoma(2.73%), seromucinous cystadenoma(4.5%), mixed germ cell tumour(1.8%), sex cord stromal tumour(1.82%), serous carcinoma(2.7%), mucinous carcinoma(0.9%), benign brenner tumour(1.82%), steroid cell tumour(0.9%), endometrioid carcinoma(0.9%) and lymphoma(0.9%).

Comparison of cytomorphological features between imprint and scrape smears such as cellularity, architectural pattern, nuclear features, cytoplasmic staining and background was done among which cellularity and architectural pattern showed a statistically significant difference with p value less than 0.001.

Overall Sensitivity, Specificity and diagnostic accuracy of cytological diagnosis of ovarian tumours was 88 %, 98% and 91%respectively.

CONCLUSION

- Imprint and scrape cytology are rapid, safe, simple & inexpensive cytodiagnostic techniques used to diagnose various tumours and tumour like lesions of ovary.
- Routine utilization of imprint and scrape cytology in ovarian tumours and tumour like lesions can help in increasing the understanding of cytomorphological features of tumours and tumour like lesions of ovary. This will help in intraoperative consultation of ovarian tumour and tumour like lesions of ovary, to determine the diagnosis of ovarian tumour and tumour like lesions of ovary which can guide surgeon for further proper surgical management of the patient.
- Imprint and scrape cytology will act as an important diagnostic tool in centres where frozen section facility is not available.
- Imprint and scrape smears ensure excellent preservation of cytological details in which the cellular architecture, nuclear features and cytoplasmic features can be easily evaluated. Also in imprint and scrape smear cytology, area studied for morphological evaluation of the lesion will be more as compared to frozen section. Thus, imprint and scrape smear cytology can also act as an adjunct to to frozen section in diagnosis of tumour and tumour like lesions of ovary.

- Limitation of the present study:

  As the cytomorphological evaluation of the smears was done by the observer who has prepared the imprint and scrape smear, hence observer bias of gross examination finding might have led to increased diagnostic accuracy in the present study.

- Recommendations:

  Further double blinded study of imprint and scrape smear evaluation in tumour and tumour like lesions of ovary may help to assess the utility of imprint and scrape smear cytology in tumour and tumour like lesions of ovary.

BIBLIOGRAPHY

1 .Mehar R, Panchonia A, Kulkarni CV. Study of imprint smears of various lesions with histological correlation. International Journal of Medical Sciences and Public Health 2014;3:486-488.

2. Sushma, Panicker S. Imprint cytology in the diagnosis of ovarian lesions. International Journal of Research and Medical Sciences 2015;3:3770-4

3. Riaz A, Khalid A, Tanwani A K. Diagnostic Accuracy of Touch Imprint Cytology in Ovarian Neoplasms. International Journal of pathology 2015;13:66-71.

4. Das C, Mukhopadhyay M, Kumar A, Sengupta M, Dhar G. A Cytohistological correlation in Ovarian tumours. International Organization of Scientific Research Journal of Dental and Medical Sciences 2014;13:01-05.

5. Jain R, Jain V, Dutta S, Awasthi S, Jain SK. Role of Intra-operative Cytology in the Diagnosis of Ovarian Neoplasms. International Journal of Scientific Study 2015;3:72-75.

6. Sardar K, Singh J, Tirkey S. Evaluation of Intraoperative cytology in ovarian tumours. International Organization of Scientific Research Journal of Dental and Medical Sciences 2017;16: 93-102.

7. Rao S, Sadiya N, Joseph L D , Rajendiran S. Role of scrape cytology in ovarian neoplasms. Journal of Cytology 2009;26:26-29.

8. Vijayakumar A. Diagnostic Utility of Intraoperative Cytology in the Management of Ovarian Tumours. Journal of Clinical and Diagnostic Research 2013;7:1047-1050.

9. Kolte S, Satarkar R N. Role of scrape cytology in the intraoperative diagnosis of tumor. Journal of Cytology 2010;27:86-90.

10. Mahore S, Bothale K, Joshi A, Wilkinson A, Patrikar A, Gowardhan V *et al*. Scrape Cytology in rapid intraoperative diagnosis of tumours. International Organization of Scientific Research Journal of Dental and Medical Sciences 2014;14:65-72.

11. Carmen A, Adela S, Silvia M, Alicia F, Griselle G, Carmen R. Contribution of Intraoperative Cytology to the Diagnosis of Ovarian Lesions Acta Cytologica 2011;55:85–91. DOI: 10.1159/000320859
12. Soumit D , Vatsala M, PA Singh, Mishra S, Sharma N. Role of Intraoperative Imprint Cytology in Diagnosis of Suspected Ovarian Neoplasms. Asian Pacific Journal of Cancer Prevention 2010;11:1389-91.
13. Bandyopadhyay A, Chakraborty J, Chowdhury AR, Bhattacharya A, Bhattachrya P, Chowdhury MK. Fine needle aspiration cytology of ovarian tumors with histological correlation. J Cytol 2012;29:35-40.
14. Shahid M, Zaheer S, Mubeen A, Rahman K, Sherwani V.The Role of Intraoperative Cytology in the Diagnostic Evaluation of Ovarian Neoplasms. Acta Cytologica 2012;56:467–473 DOI: 10.1159/000339394
15. Sireesha A,Triveni B, Sangeeta P, Srilaxmi K, Mallikarjun S. Role of imprint cytology in rapid diagnosis of ovarian neoplasms with histopathology correlation. IAIM 2018; 5(11):56-62.
16. Bohara S, Jain S, Khurana N, Shangpliang M,Agarwal S, Gandhi G. Intraoperative cytology of ovarian neoplasms with an attempt to grade epithelial tumors. J Cytol 2018;35:1-7
17. Khan N, Afroz N, Aqil B, Khan T, Ahmad I. Neoplastic and nonneoplastic ovarian masses: Diagnosis on Cytology. Journal of Cytology 2009;26(4): 129-33.
18. Deb P, Malik A, Sinha K. Intraoperative scrape cytology: Adult granulosa cell tumor of ovary. J Cytol 2011;28:207-9.
19. Khunamornpong S, Siriaunkgul S. Scrape cytology of the ovaries: Potential role in intraoperative consultation of ovarian lesions. Diagn Cytopathol 2003;28(5):250–7.

20. Y. Nagaia, N. Tanakab, F. Horiuchic, S. Ohkic, K. Sekib, S. Sekiyab. Diagnostic accuracy of intraoperative imprint cytology in ovarian epithelial tumors. International Journal of Gynecology & Obstetrics 2001;5:159-64.

21. Abdelghany M. Comparative Study between Intraoperative Frozen Section and Scrape Smear Cytology in the Diagnosis of Ovarian Neoplasm. Open Journal of Obstetrics and Gynecology 2015;5: 28-35.

22. Kar Tushar, Kar Asaranti, Mohapatra P C. Intra-operative cytology of ovarian tumours. J Obstet Gynecol 2005; 4:345-349.

23. Colin J, Stewart R, Barbara A,Eleanor K, Anup N,Sukeerat R. Value of Cytology in the Intraoperative Assessment of OvarianTumors. Cancer Cytopathology 2010;5:127-36

24. Blumenfeld W, Hashmi N, Sagerman P. Comparison of aspiration, touch and scrape preparations simultaneously obtained from surgically excised specimens. Acta Cytol 1998;42:1414–18

25. Gore C, Singh B, Chandanwale S, Gurwale S, Kumar H, Bawikar R *et al*. Imprint cytology: A boon in tissue diagnosis. Medical Journal of Dr DY Patil University 2017;10(1):58-63.

26. Dutta A, Imran R, Saikia P, Borgohain M. Histopathological spectrum of ovarian neoplasms in a tertiary care hospital. International Journal of Contemporary Medical Research 2018;5(8):H1-H4.

27. Gupta A, Singh M, Bhattacharya J, Anusha S, Jain S, Khurana N. Intraoperative Scrape Cytology from Ovarian Masss Lesions: A Study of 81 Cases. Journal of Cytology 2019;36(3):174-79.

28. Nagnath K. Clinico-Histopathological Analysis of Neoplastic and Non-Neoplastic Lesions of the Ovary: A 3-Year Prospective Study in Dhule, North Maharashtra, India. Journal Of Clinical And Diagnostic Research 2014;8:4-7.

29. Dowerah S , Agarwal S, Naiding M, Choubey R. Ovarian tumor: Types and patterns of occurrence in Barak Valley of Assam. Scholars Journal of Applied Medical Sciences 2017; 5(4):1403-06.
30. Mankar DV, Jain GK. Histopathological profi le of ovarian tumours: A twelve year institutional experience. Muller J Med Sci Res 2015;6:107-11
31. Mondal SK, Banyopadhyay R, Nag DR, Roychowdhury S, Mondal PK, Sinha SK. Histologic pattern, bilaterality and clinical evaluation of 957 ovarian neoplasms: A 10-year study in a tertiary hospital of eastern India. J Can Res Ther 2011;7:433-7.
32. Khan A, Luqman M, Jamal S, Mamoon N, Mushtaq S. Clinicopathological analysis of ovarian tumors. Pak J Pathol 2005; 16: 28-32.
33. Zubair M, Hashmi S, Afzal S, Muhammad I, Hafeez D, Hamdani S *et al*. Ovarian Tumors: A Study of 2146 Cases at AFIP, Rawalpindi, Pakistan. Austral Asian Journal of Cancer 2015;14(1): 21-26.
34. Ahmed Z, Kiyani N, Hasan SH, Muzaffar S.Gill MS. Histological Patterns of ovarian neoplasia. J Pak Med Assoc 2000; 50: 416-19.
35. Okugawa K, Hirakawa T, Fukushima K, Kamura T, Amada S, Nakano H. Relationship between age, histological type, and size of ovarian tumors. International Journal of Gynecology & Obstetrics 2001; 74(1):45-50.
36. Zaman S, Majid S, Hussain M, Chughtai O, Mahboob J, Chughtai S. A retrospective study of ovarian tumours and tumour-like lesions. J Ayub Med Coll Abbottabad 2010;22:104-08.
37. Jha R, Karki S. Histological pattern of ovarian tumors and their age distribution. Nepal Med Coll J 2008;10:81-5.
38.Wilkinson N. Pathology of the ovary, fallopian tube and peritoneum. London: Springer; 2014.
39. Naik S, Kumar S, Girija B. Clinicopathological analysis of ovarian tumours: a 10 year retrospective study. Int J Reprod Contracept Obstet Gynecol 2018;7:3216-21.

40. Michael CW, Lawrence WD, Bedrossian CW. Intraoperative consultation in ovarian lesions: A comparison between cytology and frozen section. Diagn Cytopathol 1996;15:387-94.

41. Basu P, De P, Mandal S, Ray K, Biswas J. Study of 'patterns of care' of ovarian cancer patients in a specialized cancer institute in Kolkata, eastern India. Indian J Cancer 2009;46:28-33.

42. Farooq F, Noman D, Humayun N, Naveed N, Haider A. Demographic differentials and histopathological patterns of ovarian masses. Biomedica 2015; 31:118-23

43. Ashraf A, Sheikh S, Ishfaq A, Akram A, Kamal F, Ahmad N.The relative frequency and histopathological pattern of ovarian masses. Biomedica 2012; 28:98-102.

44. Sohail I, Hayat Z, Saeed S. A comparative analysis of frequency and patterns of ovarian tumors at a tertiary care hospital between two different study periods (2002- 2009). J Post grad Med Inst 2012; 26:196-200.

45. Vaidya S, Sharma P, KC S, Vaidya SA. Spectrum of ovarian tumors in a referral hospital in Nepal. J Pathol Nepal 2014; 4:539-43.

46. Blaustein A, Kurman R, Ellenson L, Ronnett B. Blaustein's pathology of the female genital tract. New York, N.Y. etc.: Springer; 2011.

47. Dey P. Color atlas of female genital tract pathology.

48. Soslow R, Tornos C. Diagnostic pathology of ovarian tumors. New York: Springer; 2011.

49. Crum C. Gynecologic and obstetric pathology. Philadelphia, Pa: Saunders Elsevier; 2016.

50.Mutter G, Prat J. Pathology of the female reproductive tract. Edinburgh: Churchill Livingtone; 2014.

51. Ellenson LH, Pirog EC, The female genital tract. In:Kumar V, Abbas AK, Fausto N, Aster JC. Robbins and Cotran Pathological Basis of Disease 9th ed. Pennsylvania: Elsevier Inc; 2015:1022-1034

52. Panchonia A, Shukla A, Kulkarni C V, Patidar H. Histopathological spectrum of ovarian lesions in tertiary care institute of central India .JMSCR 2018;6(1) 32575-81.

53. Goldblum J, Lamps L, McKenney J, Myers J, Rosai J. Rosai and Ackerman's surgical pathology.

54. Sharadha S, Sridevi T, Renukadevi, Gowri R, Binayak D, Indra V. Ovarian Masses: Changing Clinico Histopathological Trends. J Obstetr Gynecol India 2015;65(1):34-38

55. Kurman R. WHO classification of tumours of female reproductive organs.

56. Birare S, Dale A. Clinicpathological study of ovarian tumors: A 5 year study. Ind J Pathol Oncol 2018;5(3):360- 365.

57. Sheikh S, Bashir H, Farooq S, Beigh A, Manzoor F, Reshi R. Histopathological spectrum of ovarian tumours from a referral hospital in Kashmir valley, Jammu and Kashmir, India. Int J Res Med Sci 2017;5(5):2110-14.

58. Riegelman R, Sternberg S, Mills S, Carter D. Sternberg's diagnostic surgical pathology. Philadelphia: Wolters Kluwer Lippincott Williams & Wilkins; 2010.

59.Cibas E, Ducatman B. Cytology. Philadelphia, PA: Saunders/Elsevier; 2009.

60. Kancherla J, Kalahasti R, Sekhar KPAC, Yarlagadda SB, Devi SP. Histomorphological Study of Ovarian Tumors: An Institutional Experience of 2 Years. Int J Sci Stud 2017;5(3):232-235.

61. Amita S Patel, Jignasha M Patel, Kamlesh J Shah. Ovarian tumors - Incidence and histopathological spectrum in tertiary care center, Valsad. IAIM 2018; 5(2): 84-93.

62. Ahmed M , Afroze N , Sabiha M. Morphological Pattern Of Ovarian Tumour : Experience In A Tertiary Level Hospital. Journal Of Bangladesh College Of Physicians And Surgeons 2018; 36: 5-10.

63. Makwana HH, Maru AM, Lakum NR, Agnihotri AS, Trivedi NJ, Joshi JR. The relative frequency and histopathological pattern of ovarian masses – 11 year study at tertiary care centre. Int J Med Sci Public Health 2014;3:81-84.

64. Sawant A and Mahajan S. Histopathological Study of Ovarian Lesions at a Tertiary Health Care Institute. MVP Journal of Medical Sciences 2017; 4(1): 26–29.

65. Mallika B, Chakravarthy VK, Rao DR. Histopathological study of ovarian tumours. J. Evolution Med. Dent. Sci 2019;8(09):551-554.

66. Bahadur PS, Chalise S, Pradhan B. A study of ovarian tumors at Kathmandu medical college teaching hospital. Journal of Pathology of Nepal 2017;7(2):1188-91.

67. Prakash A, Chinthakindi S, Duraiswami R. Histopathological study of ovarian lesions in a tertiary care center in Hyderabad, India: a retrospective five-year study. Int J Adv Med 2017;4(3):745-49.

PROFORMA

NAME	:	OP/IP No.:
AGE	:	HPR No:
SEX	:	Cytology No:
Address	:	

Presenting Complaints :

Past history :

Personal history :

Family history :

Treatment history :

General physical examination:

Pallor	present/absent
Icterus	present/absent
Clubbing	present/absent
Lymphadenopathy	present/absent
Edema	present/absent
Built	poor/average/well

VITALS: Pulse Rate: Respiratory Rate:

Blood pressure: Temperature:

SYSTEMIC EXAMINATION:

ULTRASONOGRAPHY FINDINGS:

CLINICAL DIAGNOSIS:

GROSS EXAMINATION OF SURGICALLY RESECTED SPECIMEN OF OVARY:

External Surface: Capsule - present/ absent

Capsule if present- intact/ breach

Excresences over the capsule- present/ absent.

Cut section: Predominantly solid / solid and cystic/ Predominantly cystic.

IMPRINT SMEAR FINDINGS:

-Cellularity
-Architecture
-Nuclear features
-Cytoplasmic features
-Background
-Cytological Diagnosis

SCRAPE SMEAR FINDINGS:

-Cellularity
-Architecture
-Nuclear features
-Cytoplasmic features
-Background
-Cytological Diagnosis

HISTOPATHOLOGICAL DIAGNOSIS:

Comparison of Cytomorphological features of Imprint and Scrape cytology.

Cytomorphological Features	**Imprint Cytology**	**Scrape Cytology**
Cellularity		
Architecture		
Nuclear features		
Cytoplasmic features		
Background		
Cytological diagnosis		

KEY TO MASTER CHART

SL No. - Serial Number

OP No. - Out Patient Number

IP No. - In Patient Number

Yrs – Years

HPR no. - Histopathology report number

Criterion	**Quantitative description**	**Point score**
CELLULARITY	Low Moderate High	1 2 3
ARCHITECTURAL PATTERN	Singly scattered Clusters Diffuse sheets/ Papillary pattern/Glandular pattern	1 2 3
NUCLEAR FEATURES	Crisp nuclear chromatin Hazy nuclear chromatin	1 2
CYTOPLASMIC STAINING	Unsatisfactory Satisfactory	1 2
BACKGROUND	Clear Mucinous/Serous/Seromucinous Hemorrhagic/Necrotic	1 2 3

Total Score: **MAXIMUM SCORE-13** **MINIMUM SCORE-5**

Sl No:	IP/OP No.	HPR No:	Name	Age(in years)	Consistency of the ovarian mass	Cellularity		Architectural pattern		Nuclear features		Cytoplasmic staining		Background		Cumulative score		Imprint diagnosis	Scrape diagnosis	Histopathology diagnosis	Morphological type	Morphological grade	Concordance	Discordance
						Imprint	Scrape	Imprint	Scrape	Imprint	Scrape	Imprint	Scrape	Imprint	Scrape	Imprint	Scrape							
1	IP/35427/17	6893/17	Anjali. A. Pawar	15	Solid ovarian mass	2	3	2	3	1	1	1	1	3	3	9	11	Dysgerminoma	Dysgerminoma	Dysgerminoma	Germ cell tumor	Malignant	YES	
2	IP/40251/17	7441/17	Sumitra .M. G	22	Solid ovarian mass	2	3	2	3	1	1	1	1	3	3	9	11	Dysgerminoma	Mixed Germ cell tumor	Mixed Germ cell tumor	Germ cell tumor	Malignant	YES	
3	IP/41729/17	7890/17	Gangawwa Aurasangh	75	Solid and cystic	2	3	2	2	1	1	1	1	2	2	8	9	Mucinous cystadenoma	Mucinous cystadenoma	Borderline Mucinous cystadenoma	Epithelial tumor	Borderline		YES
4	IP/40702/17	8059/17	Shankaramma	75	Solid ovarian mass	1	2	1	2	2	1	2	2	3	3	9	10	Inconclusive	Benign spindle cell lesion	Stromal hyperplasia	Tumor like lesion of ovary	Tumor like lesion of ovary		YES
5	IP/7225/18	158/18	Vaishnavi	35	Solid and cystic	2	3	2	2	1	1	1	1	2	2	8	9	Mucinous cystadenoma	Mucinous cystadenoma	Mucinous cystadenoma	Epithelial tumor	Benign	YES	
6	IP/45094/18	781/18	Mallamma	60	Solid ovarian mass	2	3	2	3	1	1	1	1	3	3	9	11	Steroid cell tumor	Steroid cell tumor	Steroid cell tumor	Sex cord stromal tumor	Benign	YES	
7	IP/70383/18	1176/18	Vijayalaxmi	25	Solid and cystic	1	2	2	3	1	1	1	1	2	2	7	9	Mucinous cystadenoma	Mucinous cystadenoma	Mucinous cystadenoma	Epithelial tumor	Benign	YES	
8	IP/6920/18	1225/18	Swati Gururaj	22	Solid and cystic	1	2	2	2	1	1	1	1	3	3	8	9	Mature teratoma	Mature teratoma	Mature teratoma	Germ cell tumor	Benign	YES	
9	OP/188818/18	3244/18	Bouramma	35	Solid and cystic	2	3	3	3	1	1	1	1	2	2	9	10	Serous cystadenoma	Serous cystadenoma	Serous cystadenoma	Epithelial tumor	Benign	YES	
10	IP/18974/18	3427/18	Kalawati	25	Solid ovarian mass	1	2	1	2	2	2	2	2	3	3	9	11	Inconclusive	Inconclusive	Pregnancy luteoma	Tumor like lesion of ovary	Tumor like lesion of ovary		YES
11	IP/213919/18	3701/18	Mahadevi	21	Solid ovarian mass	1	3	1	3	2	1	2	1	3	3	9	11	Inconclusive	Sex cord tumor	Sex cord tumor with annular tubules	Sex cord stromal tumor	Benign	YES	

12	IP/18476/18	4181/18	Mahadevi	32	Solid and cystic	2	3	2	3	1	1	1	1	2	2	8	8	Serous cystadenoma	Serous cystadenoma	Serous cystadenoma	Epithelial tumor	Benign	YES	
13	OP/24823 6/18	4365/18	Sunanda Biradar	50	Solid and cystic	1	3	2	3	1	1	1	1	2	2	8	10	Mucinous cystadenoma	Mucinous cystadenoma	Borderline Mucinous cystadenoma	Epithelial tumor	Borderline		YES
14	IP/25839/18	4783/18	Sunanda Metri	50	Predominantly cystic	2	3	2	3	1	1	1	1	2	2	8	10	Mucinous cystadenoma	Mucinous cystadenoma	Borderline Mucinous cystadenoma	Epithelial tumor	Borderline		YES
15	IP/280452/18	4959/18	Malanbi Sayed	65	Solid ovarian mass	1	3	1	3	2	2	2	1	3	3	9	12	Inconclusive	Benign spindle cell tumour	Fibroma	Sex cord stromal tumor	Benign	YES	
16	IP/22148/18	4551/18	Shivgangamma	70	Solid ovarian mass	2	3	2	3	1	1	1	1	3	3	9	11	Positive for malignancy	Serous carcinoma	Serous carcinoma	Epithelial tumor	Malignant	YES	
17	IP/25830/18	4563/18	Vani Jungurwad	35	Solid and cystic	1	2	1	2	1	1	1	1	3	3	7	9	Mature teratoma	Mature teratoma	Mature teratoma	Germ cell tumor	Benign	YES	
18	IP/285151/18	5047/18	Shobha Biradar	40	Solid and cystic	1	2	1	2	1	1	1	1	3	3	7	9	Mature teratoma	Mature teratoma	Mature teratoma	Germ cell tumor	Benign	YES	
19	IP/294485/18	5233/18	Laxmi Metri	38	Predominantly cystic	2	3	2	2	1	1	1	1	2	2	8	9	Mucinous cystadenoma	Mucinous cystadenoma	Mucinous cystadenoma	Epithelial tumor	Benign	YES	
20	IP/288637/18	5101/18	Indubai C Rathod	45	Solid and cystic	2	3	3	3	1	1	1	1	2	2	9	10	Serous cystadenoma	Serous cystadenoma	Borderline Serous cystadenoma	Epithelial tumor	Borderline		YES
21	IP/326069/18	5779/18	Renukakattimani	26	Predominantly cystic	1	2	1	2	2	2	1	2	3	3	8	11	Hemorrhagic cyst	Hemorrhagic cyst	Endometriotic cyst	Tumor like lesion of ovary	Tumor like lesion of ovary		YES
22	IP/351670/18	6184/18	Ammawwa	65	Solid ovarian mass	2	3	2	3	2	2	1	1	3	3	10	12	Positive for malignancy	Serous carcinoma	Serous carcinoma	Epithelial tumor	Malignant	YES	
23	IP/345051/18	6071/18	Boramma	34	Solid and cystic	1	2	1	2	1	1	1	1	3	3	7	9	Mature teratoma	Mature teratoma	Mature teratoma	Germ cell tumor	Benign	YES	

24	IP/39493/18	7075/18	Shilpa	20	Predominantly cystic	1	2	1	2	2	2	2	1	3	3	9	10	Hemorrhagic cyst	Hemorrhagic cyst	Endometriotic cyst	Tumor like lesion of ovary	Tumor like lesion of ovary		YES
25	IP/389819/18	6858/18	Shobha Doddamani	45	Solid ovarian mass	1	3	1	3	2	1	2	1	3	3	9	11	Inconclusive	Granulosa cell tumor	Granulosa cell tumor	Sex cord stromal tumor	Benign	YES	
26	IP/34350/18	7136/18	Madhumati	30	Solid and cystic	1	2	1	2	1	1	1	1	3	3	7	9	Mature teratoma	Mature teratoma	Mature teratoma	Germ cell tumor	Benign	YES	
27	IP/405576/18	7290/18	Saraswati	35	Predominantly cystic	1	2	1	2	2	2	2	2	3	3	9	11	Hemorrhagic cyst	Hemorrhagic cyst	Endometriotic cyst	Tumor like lesion of ovary	Tumor like lesion of ovary		YES
28	IP/380110/18	6702/18	Devamma	35	Predominantly cystic	2	3	3	3	1	1	1	1	2	2	11	10	Serous cystadenoma	Serous cystadenoma	Serous cystadenoma	Epithelial tumor	Benign	YES	
29	IP/421268/18	7489/18	Vaishali H	36	Solid and cystic	2	3	3	3	1	1	1	1	2	2	9	10	Seromucinous cystadenoma	Seromucinous cystadenoma	Seromucinous cystadenoma	Epithelial tumor	Benign	YES	
30	IP/229476/18	7692/18	Sunita Patil	45	Solid ovarian mass	1	3	1	3	2	1	2	1	3	3	9	11	Inconclusive	Benign spindle cell lesion	Fibroma	Sex cord stromal tumor	Benign	YES	
31	IP/378189/18	6682/18	Shridevi	26	Solid and cystic	1	2	1	2	2	2	1	1	3	3	8	10	Hemorrhagic cyst	Hemorrhagic cyst	Endometriotic cyst	Tumor like lesion of ovary	Tumor like lesion of ovary		YES
32	IP/43022/18	8044/18	Kasturi Shankar	50	Solid ovarian mass	3	3	3	3	1	1	1	1	3	3	11	11	Granulosa cell tumor	Granulosa cell tumor	Granulosa cell tumor	Sex cord stromal tumor	Benign	YES	
33	IP/440262/18	8169/18	Veena Agasar	32	Predominantly cystic	2	3	2	2	1	1	1	1	2	2	8	9	Mucinous cystadenoma	Mucinous cystadenoma	Mucinous cystadenoma	Epithelial tumor	Benign	YES	
34	IP/26/19	76/19	Shivamma	60	Solid ovarian mass	3	3	3	3	1	1	1	1	3	3	11	11	Granulosa cell tumor	Granulosa cell tumor	Granulosa cell tumor	Sex cord stromal tumor	Benign	YES	
35	IP/54615/19	1006/19	Marevva Myakeri	62	Predominantly Solid	2	3	3	3	1	1	1	1	1	1	8	9	Benign Brenner tumor	Benign Brenner tumor	Benign Brenner tumor	Epithelial tumor	Benign	YES	
36	IP/56281/19	1060/19	Bhumika Sagari	8	Predominantly Solid	3	3	3	3	1	1	1	1	3	3	11	11	Mature teratoma	Mixed germ cell tumour	Mixed Germ cell tumor	Germ cell tumor	Malignant	YES	
37	IP/5451/19	1394/19	Boramma	35	Solid and cystic	1	2	1	2	1	1	1	1	3	3	7	9	Mature teratoma	Mature teratoma	Mature teratoma	Germ cell tumor	Benign	YES	

38	IP/2777/19	148/19	Jayashree	38	Solid ovarian mass	2	3	2	3	1	1	1	1	3	3	9	11	Dygerminoma	Dygerminoma	Dygerminoma	Germ cell tumor	Malignant	YES	
39	IP/93268/19	1800/19	Husenbee	50	Predominantly Solid	1	3	1	3	2	1	2	1	1	1	7	9	Inconclusive	Benign Brenner tumor	Benign Brenner tumor	Epithelial tumor	Benign	YES	
40	IP/107748/19	2114/19	Shivamma	22	Solid and cystic	1	2	1	2	2	2	2	2	3	3	9	11	Inconclusive	Hemorrhagic cyst	Endometriotic cyst	Tumor like lesion of ovary	Tumor like lesion of ovary		YES
41	IP/59991/19	2175/19	Lata Kopad	31	Solid and cystic	2	2	2	2	1	1	1	1	3	3	9	9	Mature teratoma	Mature teratoma	Mature teratoma	Germ cell tumor	Benign	YES	
42	IP/9522/19	2222/19	Fatima sadiq nadaf	48	Solid and cystic	2	3	2	2	1	1	1	1	2	2	8	9	Serous cystadenoma	Serous cystadenoma	Serous cystadenoma	Epithelial tumor	Benign	YES	
43	IP/9519/19	2223/19	Sujata Yadrami	30	Solid ovarian mass	2	3	2	3	1	1	1	1	3	3	9	11	Dygerminoma	Dygerminoma	Dygerminoma	Germ cell tumor	Malignant	YES	
44	OP/108828/19	2224/19	Pooja Poddar	38	Solid ovarian mass	1	3	1	3	2	2	2	1	3	3	9	12	Inconclusive	Lymphoma	Non Hodgkin Lymphoma	Lymphoid tumor	Malignant	YES	
45	IP/11486/19	2740/19	Sonubai S B	60	Solid ovarian mass	3	3	3	3	1	1	1	1	3	3	11	11	Granulosa cell tumor	Granulosa cell tumor	Granulosa cell tumor	Sex cord stromal tumor	Benign	YES	
46	IP/143410/19	2845/19	Parimala	39	Solid and cystic	1	2	1	2	2	1	1	1	3	3	8	9	Hemorrhagic cyst	Hemorrhagic cyst	Endometriotic cyst	Tumor like lesion of ovary	Tumor like lesion of ovary		YES
47	IP/152328/19	3015/19	Laxmi Bai	40	Solid and cystic	1	2	1	2	2	1	1	1	3	3	8	9	Hemorrhagic cyst	Hemorrhagic cyst	Endometriotic cyst	Tumor like lesion of ovary	Tumor like lesion of ovary		YES
48	IP/171904/19	3406/19	Sangeeta p	35	Solid and cystic	2	2	2	2	1	1	1	1	3	3	9	9	Mature teratoma	Mature teratoma	Mature teratoma	Germ cell tumor	Benign	YES	
49	IP/23779/17	4917/17	Subadrabai	70	Predominantly Solid	2	3	2	3	2	1	1	1	3	3	10	11	Positive for malignancy	Mucinous carcinoma	Mucinous carcinoma	Epithelial tumor	Malignant	YES	
50	IP/696/17	4627/17	Mallamma	60	Solid and cystic	2	3	2	2	1	1	1	1	2	2	8	9	Mucinous cystadenoma	Mucinous cystadenoma	Borderline Mucinous cystadenoma	Epithelial tumor	Borderline		YES
51	IP/352816/17	6746/17	Roopali	26	Predominantly cystic	2	3	3	3	1	1	1	1	2	2	9	10	Mucinous cystadenoma	Mucinous cystadenoma	Mucinous cystadenoma	Epithelial tumor	Benign	YES	

52	IP/676/17	4555/17	Shreya	6	Predominantly Solid	1	1	1	1	1	1	1	1	3	3	7	7	Mature teratoma	Mature teratoma	Immature teratoma	Germ cell tumor	Malignant		YES
53	IP/233108/17	4611/17	Yallamma	28	Solid and cystic	2	2	2	2	1	1	1	1	3	3	9	9	Mature teratoma	Mature teratoma	Mature teratoma	Germ cell tumor	Benign	YES	
54	IP/798/17	4710/17	Shantamma	52	Predominantly Solid	3	3	3	3	1	1	1	1	3	3	11	11	Granulosa cell tumor	Granulosa cell tumor	Granulosa cell tumor	Sex cord stromal tumor	Benign	YES	
55	IP/240370/17	4731/17	Shivleela	22	Solid ovarian mass	1	3	1	3	1	1	1	1	3	3	7	11	Benign spindle cell lesion	Benign spindle cell lesion	Fibroma	Sex cord stromal tumor	Benign	YES	
56	IP/25170/17	5046/17	Swetha	24	Predominantly cystic	2	2	2	2	1	1	1	1	3	3	9	9	Mature teratoma	Mature teratoma	Mature teratoma	Germ cell tumor	Benign	YES	
57	IP/283123/17	5627/17	Mallamma	35	Solid and cystic	1	2	1	2	1	1	1	1	3	3	7	9	Mature teratoma	Mature teratoma	Mature teratoma	Germ cell tumor	Benign	YES	
58	IP/12232/18	2170/18	Geeta Basu	25	Solid and cystic	2	3	2	2	1	1	1	1	3	3	9	10	Mucinous cystadenoma	Mucinous cystadenoma	Mucinous cystadenoma	Epithelial tumor	Benign	YES	
59	IP/116603/18	1913/18	Sushila Bai	50	Solid and cystic	1	2	1	2	1	1	1	1	2	2	6	8	Mucinous cystadenoma	Mucinous cystadenoma	Borderline Mucinous cystadenoma	Epithelial tumor	Borderline		YES
60	IP/13162/18	2387/18	Roopa Kallappa	19	Solid and cystic	2	2	2	2	1	1	1	1	3	3	9	9	SeroMucinous cystadenoma	SeroMucinous cystadenoma	SeroMucinous cystadenoma	Epithelial tumor	Benign	YES	
61	IP/13346/18	2389/18	Shridevi	28	Predominantly cystic	1	2	1	2	1	1	1	1	2	2	6	8	Serous cystadenoma	Serous cystadenoma	Serous cystadenoma	Epithelial tumor	Benign	YES	
62	IP/3939/18	725/18	Gulshana	27	Solid and cystic	1	2	1	2	1	1	1	1	2	2	6	8	Serous cystadenoma	Serous cystadenoma	Serous cystadenoma	Epithelial tumor	Benign	YES	
63	IP/3552/18	731/18	Bhimawwa	65	Solid and cystic	2	2	2	2	1	1	1	1	3	3	9	9	Mucinous cystadenoma	Mucinous cystadenoma	Borderline Mucinous cystadenoma	Epithelial tumor	Borderline		YES
64	IP/67472/18	1113/18	Shilpa	19	Predominantly cystic	1	2	1	2	1	1	1	1	3	2	7	8	Serous cystadenoma	Serous cystadenoma	Serous cystadenoma	Epithelial tumor	Benign	YES	

65	IP/399325/18	7570/18	Shantabai	35	Predominantly cystic	1	2	1	2	1	1	1	1	2	2	6	8	Serous cystadenoma	Serous cystadenoma	Serous cystadenoma	Epithelial tumor	Benign	YES	
66	IP/432098/17	8197/17	Laxmi	22	Predominantly cystic	1	2	1	2	1	1	1	1	2	2	6	8	Serous cystadenoma	Serous cystadenoma	Serous cystadenoma	Epithelial tumor	Benign	YES	
67	IP/119302/18	1938/18	Sundrabai	35	Solid and cystic	1	2	1	2	1	1	1	1	2	2	6	8	Mucinous cystadenoma	Mucinous cystadenoma	Mucinous cystadenoma	Epithelial tumor	Benign	YES	
68	IP/276729/17	5406/17	Roopa rotti	29	Solid and cystic	1	2	1	2	1	1	1	1	3	2	7	8	Mucinous cystadenoma	Mucinous cystadenoma	Mucinous cystadenoma	Epithelial tumor	Benign	YES	
69	IP/273223/19	5397/17	Bharatis Mathpati	32	Solid and cystic	1	2	1	2	1	1	1	1	3	2	7	8	Mucinous cystadenoma	Mucinous cystadenoma	Mucinous cystadenoma	Epithelial tumor	Benign	YES	
70	IP/340988/17	6568/17	Bhanu	38	Predominantly cystic	1	2	1	2	1	1	1	1	2	2	6	7	Mucinous cystadenoma	Mucinous cystadenoma	Mucinous cystadenoma	Epithelial tumor	Benign	YES	
71	IP/25160/18	4585/18	Sakkubai	60	Solid and cystic	1	2	1	2	1	1	1	1	2	2	6	8	Mucinous cystadenoma	Mucinous cystadenoma	Mucinous cystadenoma	Epithelial tumor	Benign	YES	
72	IP/33666/18	6075/18	Mahananda	35	Solid and cystic	1	2	1	2	1	1	1	1	2	2	7	8	Serous cystadenoma	Serous cystadenoma	Serous cystadenoma	Epithelial tumor	Benign	YES	
73	IP/418697/18	7421/18	Sagirabee Walinke	60	Solid and cystic	1	2	1	2	1	1	1	1	3	2	7	8	Serous cystadenoma	Serous cystadenoma	Serous cystadenoma	Epithelial tumor	Benign	YES	
74	IP/34730/19	634/19	Shivkantamma	33	Predominantly cystic	1	2	1	2	1	1	1	1	2	2	6	8	Serous cystadenoma	Serous cystadenoma	Serous cystadenoma	Epithelial tumor	Benign	YES	
75	IP/2780/19	648/19	Vaishali Vijay Chatri	22	Solid and cystic	2	2	2	2	1	1	1	1	2	2	8	8	SeroMucinous cystadenoma	SeroMucinous cystadenoma	SeroMucinous cystadenoma	Epithelial tumor	Benign	YES	
76	IP/62391/19	1152/19	Sangeeta	25	Predominantly cystic	1	2	1	2	1	1	1	1	3	2	7	8	Serous cystadenoma	Serous cystadenoma	Serous cystadenoma	Epithelial tumor	Benign	YES	
77	IP/8486/19	1924/19	Syeda Nurshat Jagirdar	23	Solid and cystic	1	2	1	2	1	1	1	1	2	2	6	8	Mucinous cystadenoma	Mucinous cystadenoma	Mucinous cystadenoma	Epithelial tumor	Benign	YES	

78	IP/9569/19	2248/19	Rashmi sangamesh	21	Solid and cystic	1	2	1	2	1	1	1	1	2	2	6	8	Serous cystadenoma	Serous cystadenoma	Serous cystadenoma	Epithelial tumor	Benign	YES	
79	IP/132767/19	2650/19	Mallamma	30	Predominantly cystic	1	2	1	2	1	1	1	1	3	2	7	8	Serous cystadenoma	Serous cystadenoma	Serous cystadenoma	Epithelial tumor	Benign	YES	
80	IP/34146/19	2680/19	Kasturi Biradar	34	Solid and cystic	2	2	2	2	1	1	1	1	2	2	8	8	SeroMucinous cystadenoma	SeroMucinous cystadenoma	SeroMucinous cystadenoma	Epithelial tumor	Benign	YES	
81	IP/135644/19	2716/19	Rangamma	65	Solid and cystic	1	2	1	2	1	1	1	1	2	2	7	8	Serous cystadenoma	Serous cystadenoma	Serous cystadenoma	Epithelial tumor	Benign	YES	
82	IP/146006/19	2886/19	Manjula H	35	Predominantly cystic	1	2	1	2	1	1	1	1	2	2	6	8	Serous cystadenoma	Serous cystadenoma	Serous cystadenoma	Epithelial tumor	Benign	YES	
83	IP/15562/19	3446/19	Sujata S	25	Predominantly cystic	1	2	1	2	1	1	1	1	3	2	7	8	Mucinous cystadenoma	Mucinous cystadenoma	Mucinous cystadenoma	Epithelial tumor	Benign	YES	
84	IP/42776/17	7894/17	Annapurna K	45	Predominantly cystic	1	2	1	2	1	1	1	1	2	2	6	8	Serous cystadenoma	Serous cystadenoma	Serous cystadenoma	Epithelial tumor	Benign	YES	
85	IP/4541/18	856/18	Nagamma	45	Predominantly cystic	1	2	1	2	1	1	1	1	2	2	6	8	Serous cystadenoma	Serous cystadenoma	Serous cystadenoma	Epithelial tumor	Benign	YES	
86	IP/24104/18	4440/18	Sahana Kattimani	31	Solid and cystic	2	2	2	2	1	1	1	1	3	2	9	8	SeroMucinous cystadenoma	SeroMucinous cystadenoma	SeroMucinous cystadenoma	Epithelial tumor	Benign	YES	
87	IP/176691/19	3502/19	Gundamma Godawale	40	Solid and cystic	1	2	1	2	1	1	1	1	3	2	7	8	Serous cystadenoma	Serous cystadenoma	Serous cystadenoma	Epithelial tumor	Benign	YES	
88	IP/16494/19	3666/19	Bhagyashree S D	30	Predominantly cystic	1	2	1	2	1	1	1	1	2	2	6	8	Mucinous cystadenoma	Mucinous cystadenoma	Mucinous cystadenoma	Epithelial tumor	Benign	YES	
89	IP/305153/17	5963/17	Putalabai	44	Predominantly cystic	1	2	1	2	1	1	1	1	3	3	7	9	Mature teratoma	Mature teratoma	Mature teratoma	Germ cell tumor	Benign	YES	
90	IP/445710/18	8081/18	Renuka Madar	38	Solid and cystic	1	2	1	2	1	1	1	1	2	2	6	8	Serous cystadenoma	Serous cystadenoma	Serous cystadenoma	Epithelial tumor	Benign	YES	
91	IP/201638/19	4024/19	Shivamma Simpi	65	Predominantly cystic	1	2	1	2	1	1	1	1	3	2	7	8	Mucinous cystadenoma	Mucinous cystadenoma	Mucinous cystadenoma	Epithelial tumor	Benign	YES	

92	IP/110904/19	4034/19	Ningamma B M	33	Predominantly cystic	1	2	1	2	1	1	1	1	2	2	6	8	Serous cystadenoma	Serous cystadenoma	Serous cystadenoma	Epithelial tumor	Benign	YES	
93	IP/19079/19	4416/19	Shashikala B P	27	Solid ovarian mass	2	3	2	3	1	1	1	1	3	3	9	11	Benign spindle cell lesion	Sex cord tumor	Sex cord stromal tumor	Sex cord stromal tumor	Benign	YES	
94	IP/120786/19	4421/19	Shivamma	65	Solid ovarian mass	2	3	2	3	1	1	1	1	3	3	9	11	Positive for malignancy	Endometrioid carcinoma	Endometrioid carcinoma	Epithelial tumor	Malignant	YES	
95	IP/19268/19	4395/19	Lalbee	55	Solid ovarian mass	1	3	1	3	2	2	1	1	3	3	8	12	Inconclusive	Benign spindle cell lesion	Fibrothecoma	Sex cord stromal tumor	Benign	YES	
96	IP/220095/19	4441/19	Savitri	35	Predominantly cystic	1	2	1	2	1	1	1	1	3	2	7	8	Serous cystadenoma	Serous cystadenoma	Serous cystadenoma	Epithelial tumor	Benign	YES	
97	IP/20262/19	4619/19	Shantabai S	45	Predominantly cystic	1	2	1	2	1	1	1	1	2	2	6	8	Serous cystadenoma	Serous cystadenoma	Serous cystadenoma	Epithelial tumor	Benign	YES	
98	IP/20778/19	4651/19	Nilavva Chandram B	45	Predominantly cystic	1	2	1	2	1	1	1	1	3	2	7	8	Serous cystadenoma	Serous cystadenoma	Serous cystadenoma	Epithelial tumor	Benign	YES	
99	IP/233723/19	4739/19	Hamida Choudhari	35	Predominantly cystic	1	2	1	2	1	1	1	1	2	2	6	8	Mucinous cystadenoma	Mucinous cystadenoma	Mucinous cystadenoma	Epithelial tumor	Benign	YES	
100	IP/21176/19	4747/19	Sangeeta Vivekanand D	20	Predominantly cystic	1	2	1	2	1	1	1	1	3	2	7	8	Serous cystadenoma	Serous cystadenoma	Serous cystadenoma	Epithelial tumor	Benign	YES	
101	IP/233725/19	4750/19	Pravina Begum	35	Solid and cystic	1	2	1	2	2	1	1	1	3	3	8	9	Hemorrhagic cyst	Hemorrhagic cyst	Endometriotic cyst	Tumor like lesion of ovary	Tumor like lesion of ovary		YES
102	IP/21634/19	4810/19	Pooja Prasad K	25	Predominantly cystic	1	2	1	2	1	1	1	1	2	2	6	8	Serous cystadenoma	Serous cystadenoma	Serous cystadenoma	Epithelial tumor	Benign	YES	
103	IP/240024/19	4878/19	Gangamma Biradar	55	Solid ovarian mass	2	3	2	3	1	1	1	1	3	3	9	11	Serous carcinoma	Serous carcinoma	Serous carcinoma	Epithelial tumor	Malignant	YES	
104	IP/138314/19	5092/19	Savita Sagar Parsi	27	Predominantly cystic	1	2	1	2	1	1	1	1	3	2	7	8	Serous cystadenoma	Serous cystadenoma	Serous cystadenoma	Epithelial tumor	Benign	YES	
105	IP/259650/19	5281/19	Mahananda Jambagi	28	Predominantly cystic	1	2	1	2	1	1	1	1	3	2	7	8	Serous cystadenoma	Serous cystadenoma	Serous cystadenoma	Epithelial tumor	Benign	YES	

106	IP/261295/19	5316/19	Manjula Rathod	35	Predominantly cystic	1	2	1	2	1	1	1	1	2	2	6	8	Serous cystadenoma	Serous cystadenoma	Serous cystadenoma	Epithelial tumor	Benign	YES	
107	IP/22724/19	5356/19	Shantabai S K	55	Predominantly cystic	1	2	1	2	1	1	1	1	3	2	7	8	Serous cystadenoma	Serous cystadenoma	Serous cystadenoma	Epithelial tumor	Benign	YES	
108	IP/271389/19	5509/19	Gangabai	40	Predominantly cystic	1	2	1	2	1	1	1	1	3	2	7	8	Serous cystadenoma	Serous cystadenoma	Serous cystadenoma	Epithelial tumor	Benign	YES	
109	IP/23964	5524/19	Jayashree	45	Predominantly cystic	1	2	1	2	1	1	1	1	2	2	6	8	Mucinous cystadenoma	Mucinous cystadenoma	Mucinous cystadenoma	Epithelial tumor	Benign	YES	
110	IP/281423/19	5691/19	Revamma	50	Predominantly solid	1	2	1	2	1	1	1	1	3	3	10	9	Positive for malignancy	Positive for malignancy	Metastatic invasive lobular carcinoma of breast	Metastatic	Metastatic	YES	