RESEARCH PAPER

Neoplastic Ovarian Tumors Across WHO-Defined Categories: A Morphological and Comparative Study from a Tertiary Care Hospital

Dr. Darshana Narayan Wakkar[1]*, Dr. Prashant Shrimant Dortkar[2], Dr. Madhuri Roy[3]

[1]Associate Professor; Department: Pathology; Institute: Bharati Vidyapeeth (Deemed to be University) Medical College and Hospital, Sangli; Email: darshanawakkar@gmail.com

[2]Assistant Professor; Department: General Surgery; Institute: Government Medical College, Miraj; Email: prashantdortkar@yahoo.in

[3]Consultant Pathologist; Department: Pathology; Institute: Pathkind Diagnostics Pvt. Ltd.; Email: ms.madhuriroy@gmail.com

**Corresponding Author: Dr. Darshana Narayan Wakkar; Email: darshanawakkar@gmail.com*

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ABSTRACT

Background: Neoplastic ovarian tumors exhibit diverse morphological characteristics across WHO-defined categories, with geographic variation in their relative incidence. Accurate histomorphological subtyping is critical for prognosis, chemotherapy sensitivity, and surgical planning.

Aim: To analyze the distribution, morphological characteristics, and comparative patterns of neoplastic ovarian tumors across WHO-defined categories — surface epithelial, sex cord-stromal, germ cell, and metastatic — in relation to age, laterality, and published literature from other geographic regions.

Methods: Among 67 ovarian lesions evaluated prospectively (June 2022–June 2024), 51 confirmed neoplastic cases were classified per WHO 2020 criteria and analyzed for morphological characteristics, age distribution, and laterality. Findings were compared with published Indian and international studies.

Results: Of 51 neoplastic tumors, surface epithelial tumors were most common (76.4%), with serous cystadenoma (22.3%) and mucinous cystadenoma (19.4%) predominating among benign lesions. High-grade serous carcinoma (3%) was the most frequent malignancy. Germ cell tumors constituted 15.7%, with mature cystic teratoma (9%) most prevalent. Sex cord-stromal tumors (5.9%) included fibroma, fibrothecoma, and adult granulosa cell tumor (1.5% each). One case of Krukenberg tumor (1.9%) was identified. Benign lesions peaked in the 3rd–4th decade; malignant lesions in the 4th–5th decade. Findings were largely concordant with Indian literature, with notable geographic variation compared to Western studies.

Conclusion: Surface epithelial tumors dominate neoplastic ovarian disease. WHO-based histomorphological subtyping enables clinically relevant diagnosis and guides treatment decisions across all tumor categories.

Keywords: Ovarian neoplasms/classification; Carcinoma, ovarian epithelial; Sex cord-gonadal stromal tumors; Teratoma; Krukenberg tumor; World Health Organization

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BACKGROUND

Ovarian neoplasms represent one of the most morphologically heterogeneous groups of tumors encountered in surgical pathology. Arising from three distinct cell lineages, the surface coelomic epithelium, the totipotent germ cells, and the sex cord-stromal cells which are primary ovarian tumors exhibit remarkable diversity in their biological behavior, age-specific incidence, clinical presentation, and response to treatment. This diversity, codified through successive editions of the World Health Organization (WHO) classification, necessitates precise histomorphological subtyping for clinically meaningful diagnosis and management.1,2

Surface epithelial tumors constitute the largest category of ovarian neoplasms, accounting for nearly 90% of all ovarian malignancies. They encompass serous, mucinous, endometrioid, clear cell, Brenner, and seromucinous subtypes, each carrying distinct molecular profiles, 5-year survival rates, and chemosensitivity patterns. High-grade serous carcinoma (HGSC), characterized by TP53 mutations and genomic instability, is the most lethal subtype and is frequently diagnosed at an advanced stage. In contrast, mucinous and endometrioid carcinomas tend to present at earlier stages with comparatively better prognoses. Borderline tumors, representing an intermediate category, require careful recognition due to their indolent behavior and specific surgical management strategies.2,3

Germ cell tumors, predominantly affecting children and young women, account for 20–30% of all ovarian tumors. Mature cystic teratoma (dermoid cyst) is by far the most common benign germ cell tumor, while malignant counterparts such as dysgerminoma, yolk sac tumor, and embryonal carcinoma are rare but clinically aggressive.4 Mixed germ cell tumors, comprising two or more malignant germ cell components, present unique diagnostic and therapeutic challenges requiring immunohistochemical confirmation of individual components. Monodermal teratomas such as struma ovarii, though rare, deserve recognition due to their potential for functional activity and malignant transformation.4,5

Sex cord-stromal tumors account for approximately 5–8% of all ovarian neoplasms and include a spectrum of tumors derived from granulosa cells, theca cells, Sertoli cells, Leydig cells, and fibroblasts. Granulosa cell tumors, particularly the adult type carry malignant potential with a risk of late recurrence, while fibroma and fibrothecoma are invariably benign. These tumors are frequently associated

with hormonal manifestations and are characterized by specific morphological features, including Call-Exner bodies and nuclear grooving in adult granulosa cell tumors.6 Metastatic tumors to the ovary, though constituting a small fraction, carry significant clinical importance as they may present as primary ovarian masses and mislead surgical and oncological management. Krukenberg tumors, characterized by mucin-secreting signet ring cells within a cellular stroma, most commonly originate from a gastric primary and are associated with a poor prognosis. Recognition of metastatic disease requires thorough clinicopathological correlation and, frequently, immunohistochemical workup.6,7

Geographic and regional variation in the relative incidence of ovarian tumor subtypes has been well documented in published literature. Studies from Western nations report higher rates of high-grade serous carcinoma, while Indian studies show a relatively higher proportion of benign surface epithelial tumors. These variations likely reflect differences in population age structure, genetic background, reproductive patterns, and referral bias. Comparative analysis with literature from multiple geographic regions is therefore essential to contextualize local findings and contribute to the global understanding of ovarian tumor epidemiology.8,9

Despite the availability of published studies from various Indian centers, data on the WHO-category-wise distribution and morphological characterization of neoplastic ovarian tumors specific to tertiary care hospitals in western India remain limited. In this context, the present study was undertaken with the aim to analyze the distribution, morphological characteristics, and comparative patterns of neoplastic ovarian tumors across WHO-defined categories — surface epithelial, sex cord-stromal, germ cell, and metastatic — in relation to age, laterality, and published literature from other geographic regions.

MATERIALS AND METHODS

Study Design and Setting: This study was conducted as a prospective, descriptive, cross-sectional analysis within the Department of Pathology, Bharati Vidyapeeth Deemed to be University and Medical College, Pune, over two years from June 2022 to June 2024. The present study forms the neoplastic sub-analysis of a larger prospective cohort of 67 ovarian lesion cases evaluated during the same period.

Study Population: Of 67 total ovarian lesion cases enrolled in the parent study, 51 histopathologically confirmed neoplastic cases were included for analysis in this study. Non-neoplastic (tumor-like) lesions (n=16) were excluded from this analysis.

Sample Size: Sample size for the parent cohort was calculated using power analysis for a single proportion (SPSS version 29.0), based on a departmental population proportion of 0.041, power of 80%, and a significance level of 5%, yielding a minimum sample size of 64. A total of 67 cases were enrolled, of which 51 were neoplastic.

Inclusion Criteria: All surgically resected ovarian specimens and biopsies confirmed as neoplastic on histopathological examination during the study period were included.

Exclusion Criteria: Inadequate or autolysed specimens were excluded. Non-neoplastic lesions were excluded from this specific analysis.

Specimen Processing: All specimens — total abdominal hysterectomy, unilateral oophorectomy, and bilateral salpingo-oophorectomy — underwent standard gross pathological examination with documentation of size, laterality, external surface, consistency, and cut-surface characteristics. Representative sections were embedded in paraffin, sectioned at 4–5 microns, and stained with Hematoxylin and Eosin (H&E). Immunohistochemistry and special stains were applied where required for subtype confirmation, particularly in sex cord-stromal and metastatic tumors.

Tumor Classification: All neoplastic tumors were classified per the WHO 2020 Classification of Female Genital Tumors into four primary categories: surface epithelial tumors, sex cord-stromal tumors, germ cell tumors, and metastatic tumors. Within each category, tumors were further subclassified as benign, borderline, or malignant. FIGO staging was applied to malignant cases where applicable.

Data Collection and Analysis: Clinical parameters including patient age, presenting symptoms, laterality, and surgical procedure were recorded. Data were compiled in Microsoft Excel and analyzed using SPSS version 29.0. Descriptive statistics (frequency, percentage) were computed for all variables. Findings were systematically compared with published literature from Indian and international studies representing diverse geographic regions, using comparison tables for each WHO-defined category.

RESULTS

Of the 67 ovarian lesion cases analyzed during the study period, 51 cases were histopathologically confirmed as neoplastic and form the study population for this analysis. These were classified into four WHO 2020-defined categories: surface epithelial tumors, sex cord-stromal tumors, germ cell tumors, and metastatic tumors.

Table 1. Distribution of Neoplastic Ovarian Tumors by WHO Category and Morphological Type (n=51)

WHO Category	Benign n (%)	Borderline n (%)	Malignant n (%)	Total n (%)
Surface epithelial tumors	33 (64.7)	2 (3.9)	4 (7.8)	39 (76.4)
Germ cell tumors	7 (13.7)	0	1 (1.9)	8 (15.7)
Sex cord-stromal tumors	2 (3.9)	0	1 (1.9)	3 (5.9)
Metastatic tumors	—	—	1 (1.9)	1 (1.9)
Total	43 (84.3)	2 (3.9)	6 (11.7)	51 (100)

Percentages calculated out of total neoplastic cases (n=51).

Surface epithelial tumors constituted the largest WHO category, accounting for 76.4% of all neoplastic lesions, followed by germ cell tumors (15.7%), sex cord-stromal tumors (5.9%), and metastatic tumors (1.9%). Across all categories, benign tumors predominated (84.3%), with malignant lesions accounting for 11.7% and borderline tumors for 3.9% of all neoplastic cases. All borderline tumors belonged to the surface epithelial category. Malignant lesions were distributed across surface epithelial

(4 cases), germ cell (1 case), sex cord-stromal (1 case), and metastatic (1 case) categories.

Table 2. Histopathological Subtypes of Surface Epithelial Ovarian Tumors (n=39)

Histopathological Subtype	Number of Cases	% of Surface Epithelial (n=39)	% of All Neoplasms (n=51)
Benign (n=33)			
Serous cystadenoma	15	38.4	22.3
Mucinous cystadenoma	9	23.0	13.4
Mucinous cystadenoma with focal epithelial proliferation	4	10.2	6.0
Serous cystadenofibroma	3	7.6	4.4
Serous cystadenoma with mature cystic teratoma (collision)	1	2.5	1.5
Mucinous cystadenofibroma	1	2.5	1.5
Borderline (n=2)			
Serous borderline tumor	1	2.5	1.5
Mucinous borderline tumor	1	2.5	1.5
Malignant (n=3)			
High-grade serous carcinoma (HGSC)	2	5.1	3.0
Mucinous adenocarcinoma	1	2.5	1.5
Brenner Tumor (n=1)			
Mixed benign Brenner with mucinous cystadenoma	1	2.5	1.5
Total	39	100	76.4

Among surface epithelial tumors (n=39), benign lesions accounted for 84.6% (n=33), with serous cystadenoma being the most common individual diagnosis (38.4% of surface epithelial tumors; 22.3% of all neoplasms), followed by mucinous cystadenoma (23.0%). A rare case of collision tumor which comprises of serous cystadenoma with a co-existing mature cystic teratoma was identified in a 42-year-old female patient, representing a diagnostically uncommon entity with only a few similar cases documented in published literature. Borderline tumors comprised equal numbers of serous and mucinous subtypes (one each). Among malignant surface epithelial tumors, high-grade serous carcinoma (HGSC) was the most prevalent subtype (2 cases, 3.0%), followed by mucinous adenocarcinoma (1 case, 1.5%). One case of mixed benign Brenner tumor with mucinous cystadenoma was identified, representing a rare combined epithelial neoplasm.

Table 3. Histopathological Subtypes of Germ Cell Tumors (n=8)

Histopathological Subtype	Number of Cases	% of Germ Cell Tumors (n=8)	% of All Neoplasms (n=51)
Mature germ cell (Benign)			
Mature cystic teratoma (Dermoid cyst)	6	75.0	9.0
Struma ovarii (Monodermal teratoma)	1	12.5	1.5
Malignant germ cell			
Mixed germ cell tumor (YST + embryonal carcinoma)	1	12.5	1.5
Total	8	100	15.7

Germ cell tumors constituted 15.7% of all neoplastic cases (n=8). Mature cystic teratoma was the most prevalent subtype, accounting for 75.0% of germ cell tumors (9.0% of all neoplasms). These lesions were predominantly observed in the second and third decades of life. One case of struma ovarii, a monodermal teratoma composed entirely of thyroid-type follicles filled with colloid, was identified in a 65-year-old female. One case of malignant mixed germ cell tumor was encountered in an 18-year-old female, comprising components of yolk sac tumor, confirmed by the presence of Schiller-Duval bodies and embryonal carcinoma, identified by sheets of primitive atypical cells with brisk mitotic activity. This case highlighted the morphological complexity of malignant germ cell tumors and the need for thorough sampling and, when appropriate, immunohistochemical confirmation.

Table 4. Histopathological Subtypes of Sex Cord-Stromal Tumors (n=3)

Histopathological Subtype	Tumor Component	Number of Cases	% of Sex Cord-Stromal (n=3)	% of All Neoplasms (n=51)
Pure Stromal Tumors				
Fibroma	Spindle cell stromal	1	33.3	1.5

Histopathological Subtype	Tumor Component	Number of Cases	% of Sex Cord-Stromal (n=3)	% of All Neoplasms (n=51)
Fibrothecoma	Mixed spindle + theca cells	1	33.3	1.5
Pure Sex Cord Tumors				
Adult granulosa cell tumor (AGCT)	Granulosa cells + Call-Exner bodies	1	33.3	1.5
Total		3	100	5.9

Sex cord-stromal tumors accounted for 5.9% of all neoplastic cases. Each subtype was represented by a single case (1.5% each). Fibroma demonstrated characteristic spindle-shaped cells with tapered nuclei arranged in interlacing fascicles and bundles. Fibrothecoma showed a combination of spindle-shaped fibromatous cells admixed with ovoid cells containing moderate eosinophilic cytoplasm, consistent with thecomatous differentiation. The adult granulosa cell tumor (AGCT), identified in a 50-year-old female, exhibited diffuse sheets of granulosa cells with numerous Call-Exner bodies and the characteristic nuclear grooming imparting a "coffee-bean" appearance. Although classified as a low-grade malignancy with potential for late recurrence, the gross and microscopic features in this case were consistent with the adult type. All three sex cord-stromal tumors presented as grossly purely solid lesions and were unilateral.

5A. Metastatic Tumor

Table 5. Metastatic Tumor and Summary of Malignant Cases (n=6)

Histopathological Subtype	Primary Site	Gross Feature	Key Microscopic Feature	Number of Cases
Krukenberg tumor	Gastric (primary)	Purely solid, bilateral	Signet ring cells in cellular spindle stroma, mucin positivity	1 (1.5%)

5B. Summary of All Malignant Neoplastic Cases (n=6)

Case	Age (Years)	WHO Category	Diagnosis	Laterality	Gross
1	55	Surface epithelial	HGSC	Unilateral	Solid-cystic
2	62	Surface epithelial	HGSC	Unilateral	Solid-cystic
3	60	Surface epithelial	Mucinous adenocarcinoma	Unilateral	Solid-cystic
4	50	Sex cord-stromal	Adult granulosa cell tumor	Unilateral	Solid
5	18	Germ cell	Mixed germ cell tumor	Unilateral	Solid-cystic
6	36	Metastatic	Krukenberg tumor	Bilateral	Solid

One case of metastatic tumor was identified which was a Krukenberg tumor in a 36-year-old female presenting with abdominal mass and ascites. Histopathological examination revealed clusters of signet ring cells, characteristically distended with intracytoplasmic mucin, infiltrating a highly cellular spindle-shaped ovarian stroma. The bilateral ovarian involvement and clinical workup were consistent with a gastric primary. This case represented the only bilateral ovarian lesion in the entire study (1.4% of all cases). Among the six malignant cases, surface epithelial carcinomas predominated (3 cases; 50%), and solid-cystic gross morphology was the most consistent gross feature of malignancy. All malignant cases, with the exception of the Krukenberg tumor, were unilateral on presentation.

Table 6. Age Distribution of Neoplastic Tumors by WHO Category (n=51)

Age Group (Years)	Surface Epithelial n (%)	Germ Cell n (%)	Sex Cord-Stromal n (%)	Metastatic n (%)	Total n (%)
11–20	2 (3.9)	3 (5.9)	0	0	5 (9.8)
21–30	8 (15.7)	4 (7.8)	1 (1.9)	0	13 (25.4)
31–40	14 (27.4)	1 (1.9)	1 (1.9)	1 (1.9)	17 (33.3)
41–50	11 (21.5)	0	1 (1.9)	0	12 (23.5)
51–60	3 (5.9)	0	0	0	3 (5.9)
61–70	0	0	0	0	0
71–80	1 (1.9)	0	0	0	1 (1.9)
Total	39 (76.4)	8 (15.7)	3 (5.9)	1 (1.9)	51 (100)

Percentages calculated out of total neoplastic cases (n=51).

Age-stratified analysis across WHO categories revealed distinct patterns of tumor occurrence. Surface epithelial tumors showed the widest age distribution, spanning from the second to the eighth decade, with peak incidence in the 31–40-year age group (27.4%) followed by the 41–50-year group (21.5%). Germ cell tumors demonstrated a predilection for younger patients, with the highest frequency in the 11–20-year age group (5.9%), followed by the 21–30-year group (7.8%), consistent with their well-established biological behavior. Sex cord-stromal tumors were distributed across the third to fifth decades. The single metastatic case (Krukenberg tumor) was identified in the fourth decade. The overall peak decade for neoplastic ovarian tumors in this study was the fourth decade (31–40 years), accounting for 33.3% of all neoplastic cases.

DISCUSSION

Neoplastic ovarian tumors constitute a morphologically heterogeneous group of lesions arising from three distinct cell lineages, classified by the WHO 2020 framework into surface epithelial, sex cord-stromal, germ cell, and metastatic categories, each carrying distinct biological behavior, age-specific incidence, and clinical implications. Accurate histomorphological subtyping is indispensable for

guiding chemotherapy selection, surgical decision-making, and long-term prognostic counseling. Geographic variation in the relative incidence of tumor subtypes further necessitates institution-specific studies to contextualize local findings within the broader epidemiological landscape.4,10 The present study was conducted at a tertiary care hospital with the objective of evaluating the distribution and morphological characteristics of neoplastic ovarian tumors across WHO-defined categories, with systematic comparison against published literature from Indian and other geographic regions.

Surface epithelial tumors constituted the most common WHO category, accounting for 76.4% of neoplastic cases. This was concordant with Mehra P et al, who reported surface epithelial tumors in 70% of 110 cases from Patna classified using WHO 2020 guidelines. Samalla S et al documented surface epithelial predominance in 82.9% of 76 neoplastic cases from Nizamabad.11 Patel N et al, in the largest Indian comparative series of 480 cases from western Maharashtra, reported surface epithelial tumors in 67.91%, while Ahuja S et al from Uttarakhand documented 73.1% in their retrospective series of 130 cases.12,13 Anitha Pallikkara V et al reported 76.32% surface epithelial tumors in 245 cases from Kerala, and Sheela KM et al identified this category as the most common neoplasm in their large 597-case series from Thiruvananthapuram.14,15 Chalana JN et al reported epithelial tumors as the most common category (66.6%) in their 80-case series, further reinforcing the consistent dominance of surface epithelial neoplasms across all Indian tertiary care studies irrespective of sample size or geographic region.16

Among surface epithelial tumors, serous cystadenoma was the most common benign entity, constituting 22.3% of all neoplasms. This was consistent with Nair RV et al, who reported serous cystadenoma as the most common benign lesion (44.3%) from Kerala, and with Mehra P et al, who documented serous cystadenoma in 38% of cases.10,17 Gaikwad SL et al reported it as the most frequent benign ovarian tumor (40.5%), while Patel N et al identified serous tumors as the most frequent neoplasms (45%).12,18 Mucinous cystadenoma represented 19.4% of neoplasms, consistent with Gaikwad SL et al, who documented mucinous cystadenoma in 32.4% of benign cases.18 A rare collision tumor comprising serous cystadenoma with a co-existing mature cystic teratoma was identified in a 42-year-old female, an unusual entity with only sporadic published reports, requiring thorough characterization of both tumor components for accurate management.

Borderline tumors included one serous and one mucinous case (1.5% each), mirroring the balanced distribution reported by Gaikwad SL et al, who documented one case each of serous and mucinous borderline tumors in their Maharashtra series.18 Among malignant surface epithelial tumors, high-grade serous carcinoma was the most common subtype (3%), concordant with Ahuja S et al, who identified serous carcinoma as the most common malignant tumor, and with Mehra P et al, who reported HGSC as the predominant malignancy (9%).10,13 Azad S et al from Dehradun similarly confirmed serous carcinoma as the most frequent primary malignant tumor in their 114-case series, with WHO 2020 reclassification enabling more refined categorization into high-grade and low-grade subtypes with distinct molecular and therapeutic implications.19

Germ cell tumors constituted 15.7% of neoplastic cases, with mature cystic teratoma the most prevalent subtype (9%). This was concordant with Mehra P et al, who reported mature teratoma as the second most common benign tumor (16.3%), and with Lokeshwari V et al, whose dedicated germ cell tumor study from Chennai documented benign cystic teratomas as the most common germ cell neoplasm (76%).10,20 Azad S et al identified mature teratoma constituting 97.5% of germ cell tumors in their Dehradun series. One case of malignant mixed germ cell tumor comprising yolk sac and embryonal carcinoma components was identified in an 18-year-old female, a diagnostically complex entity confirmed by immunohistochemical markers.19 Ahuja S et al similarly reported a mixed germ cell tumor case within their North Indian cohort.13 One case of struma ovarii was identified in a 65-year-old female, a rare monodermal variant also reported by Ahuja S et al, who additionally documented neuroendocrine tumors arising within monodermal teratomas in their series.13

Sex cord-stromal tumors accounted for 5.9% of neoplastic cases, comprising one case each of fibroma, fibrothecoma, and adult granulosa cell tumor (1.5% each). Sampurna K et al documented sex cord-stromal tumors in 5% of their 200 cases.1 Anitha Pallikkara V et al reported 5.03%, with adult granulosa cell tumor as the most common malignant sex cord entity.14 Chalana JN et al similarly identified adult granulosa cell tumor as the most common sex cord-stromal tumor.16 Gaikwad SL et al documented all sex cord-stromal cases as fibrothecoma, contrasting with the present study where all three subtypes were equally represented. All sex cord-stromal tumors in this study were unilateral and purely solid, consistent with their established morphological characteristics.18

One case of Krukenberg tumor was identified (1.9%), presenting with bilateral ovarian involvement in a 36-year-old female with suspected gastric primary. Mehra P et al reported two Krukenberg tumor cases, while Azad S et al documented four secondary tumors including Krukenberg tumors (2.87%).10,19 Ahuja S et al from Uttarakhand also reported one Krukenberg tumor, confirming the low but consistent prevalence of metastatic ovarian disease across Indian tertiary care studies.13

The age-stratified analysis revealed that germ cell tumors predominantly occurred in the 11–30-year age group, surface epithelial tumors peaked in the 31–50-year group, and malignant lesions were most frequently encountered in the 41–60-year range. This age-dependent distribution was concordant with Samalla S et al, who reported benign tumors most commonly in the 21–30-year group and malignant tumors in the 41–50-year group.11 Ahuja S et al similarly documented the youngest patient as a 15-year-old with serous cystadenoma and the oldest as a 75-year-old with serous carcinoma, underscoring the wide age spectrum of ovarian neoplasia and the importance of maintaining high diagnostic vigilance across all age groups in clinical pathology practice.13

The present study is limited by its single-center design and relatively small neoplastic sample size of 51 cases, which constrains statistical subgroup analysis and limits broader generalizability. Despite these limitations, the prospective design, rigorous application of WHO 2020 classification, and detailed morphological characterization of rare entities including collision tumors, struma ovarii, and mixed germ

cell tumors constitute meaningful contributions to the ovarian tumor pathology literature. Clinically, the predominance of benign surface epithelial tumors in reproductive-age women supports conservative surgical management with intraoperative frozen section guidance to avoid unnecessary bilateral oophorectomy. The identification of malignant sex cord-stromal and germ cell tumors in younger patients underscores the importance of age-appropriate clinical suspicion and timely histomorphological evaluation, as accurate WHO-based subtyping directly influences treatment planning, chemotherapy selection, and prognostic counseling for patients with ovarian neoplasms.

CONCLUSION

The present study confirms that surface epithelial tumors dominate the neoplastic ovarian tumor profile, with serous cystadenoma being the most common benign entity and high-grade serous carcinoma the most frequent malignancy. WHO 2020-based histomorphological subtyping across surface epithelial, germ cell, sex cord-stromal, and metastatic categories provides clinically meaningful diagnostic information essential for treatment planning, chemotherapy selection, and prognostic assessment. Age-stratified tumor distribution and findings of rare entities including collision tumors, struma ovarii, and mixed germ cell tumors further underscore the diagnostic complexity inherent in ovarian neoplasm evaluation.

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FIGURES

SEROUS CYSTADENOMA WITH MATURE CYSTIC TERATOMA

Fig 1A - Gross: Cut section shows tufts of hair and pultaceous material.

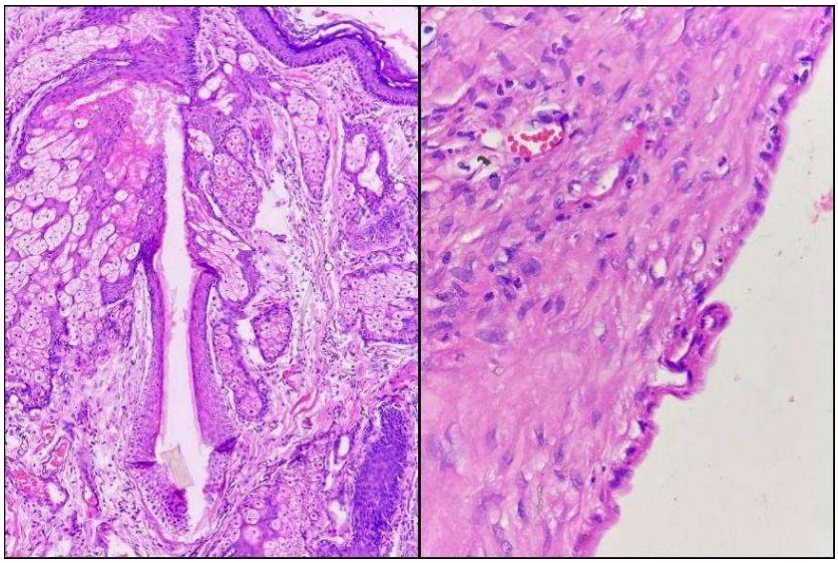

Fig 1B - Microscopy, 10x (H&E): Cyst wall partially lined by mature epidermis with skin adnexal structures. Fig 1C - Microscopy, 40x (H&E): Fibrocollagenous cyst wall lined by single layer of flattened to cuboidal epithelium.

MUCINOUS CYSTADENOMA

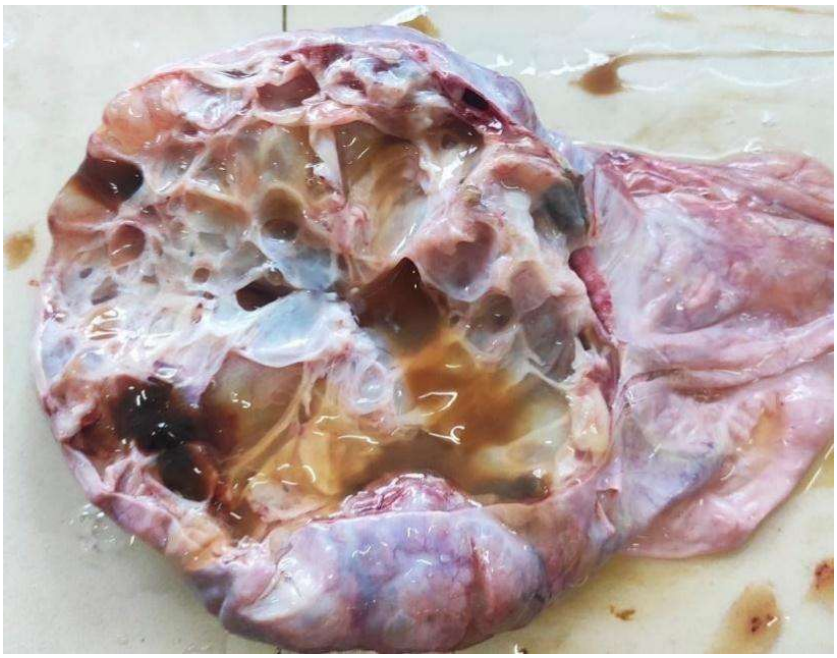

Fig 2A - Gross: Outer surface is bosselated. Cut section shows multiloculated cyst containing mucinous fluid.

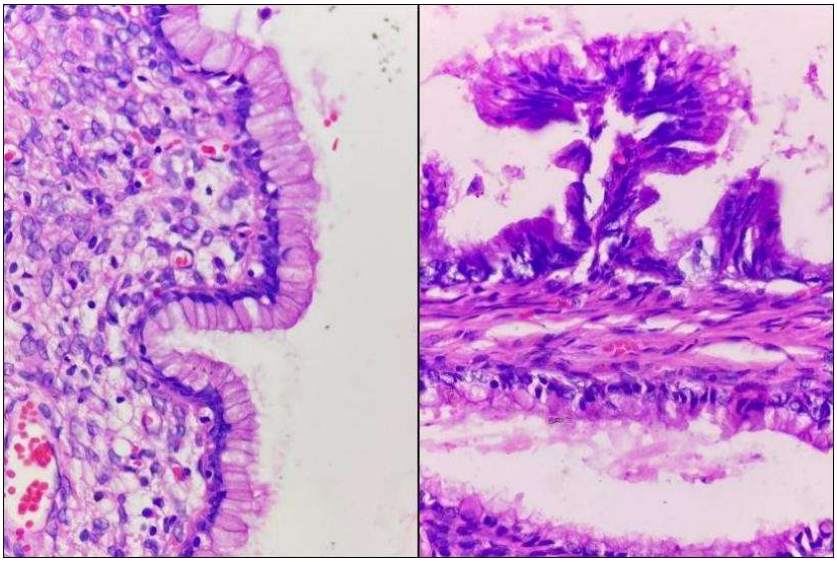

Fig 2B - Microscopy, 40x (H&E): Cyst lined by single layer of intestinal type tall columnar mucinous epithelium. Fig 2C - Microscopy, 40x (H&E): Focally showing variable degree of stratification (<10%).

HIGH-GRADE SEROUS CARCINOMA

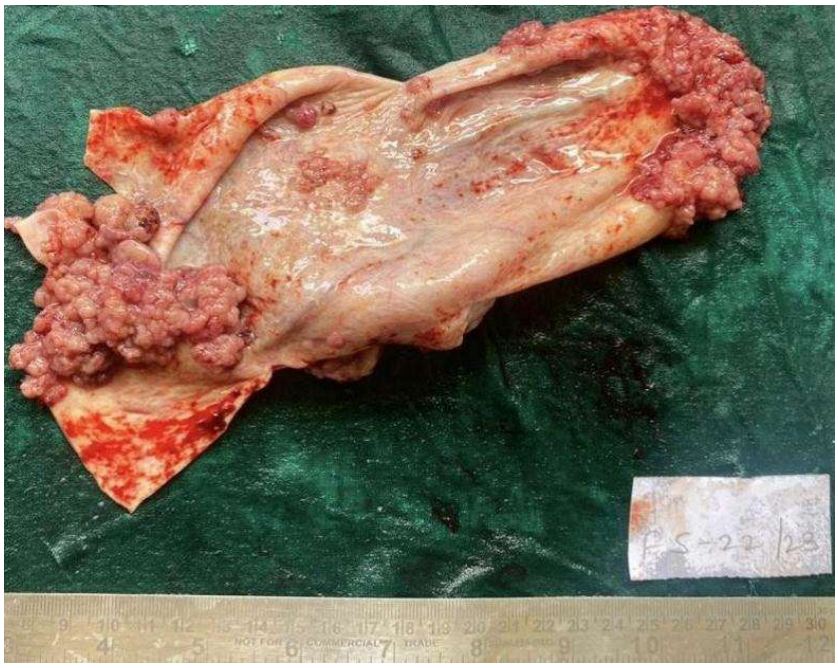

Fig 3A - Gross: Partly solid and cystic unilocular cyst with inner wall showing multiple papillary excrescences.

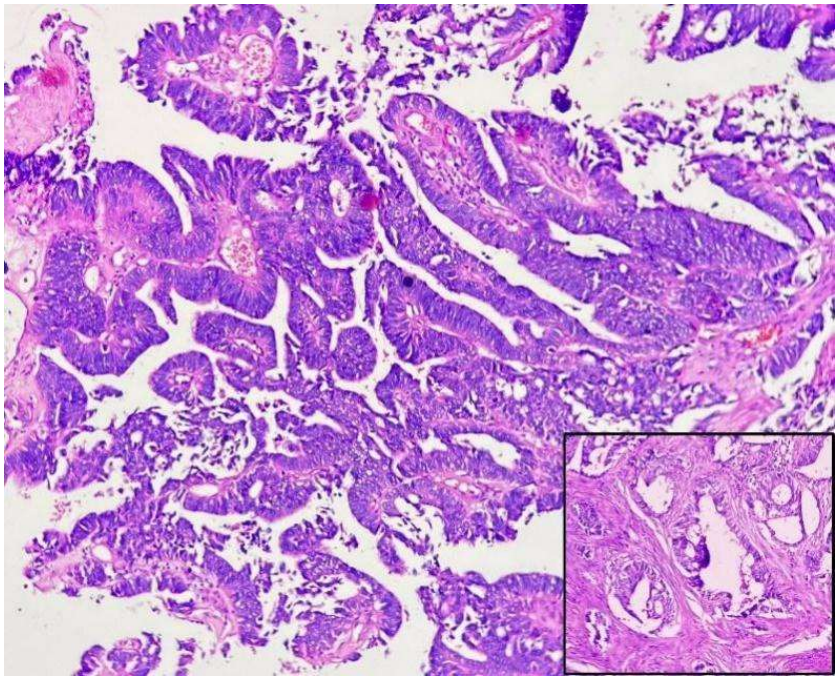

Fig 3B - Microscopy, 10x (H&E): Architecturally complex papillae with fibrovascular core lined by pseudostratified tumour cells. Inset, 40x (H&E), showing stromal invasion.

MUCINOUS ADENOCARCINOMA

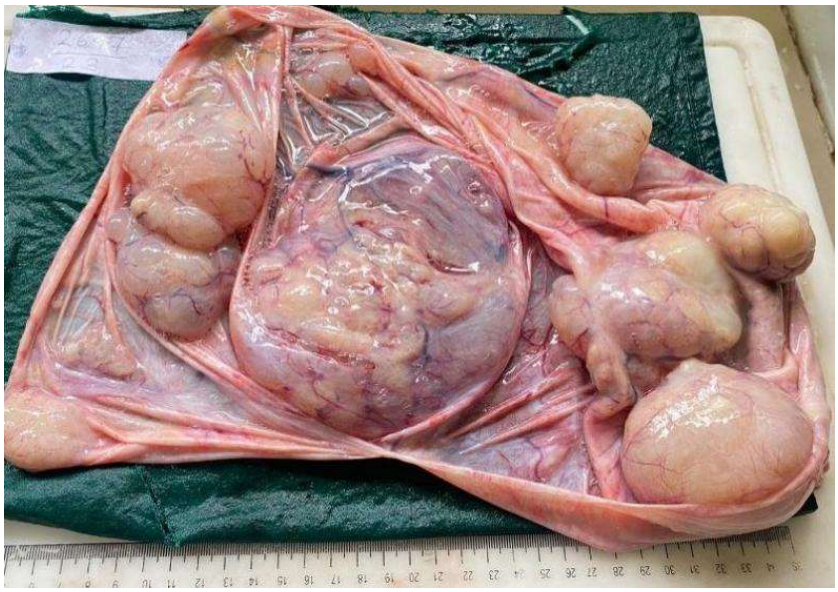

Fig 4A - Gross: Cut section shows unilocular cyst with multiple polypoidal mass containing mucoid material.

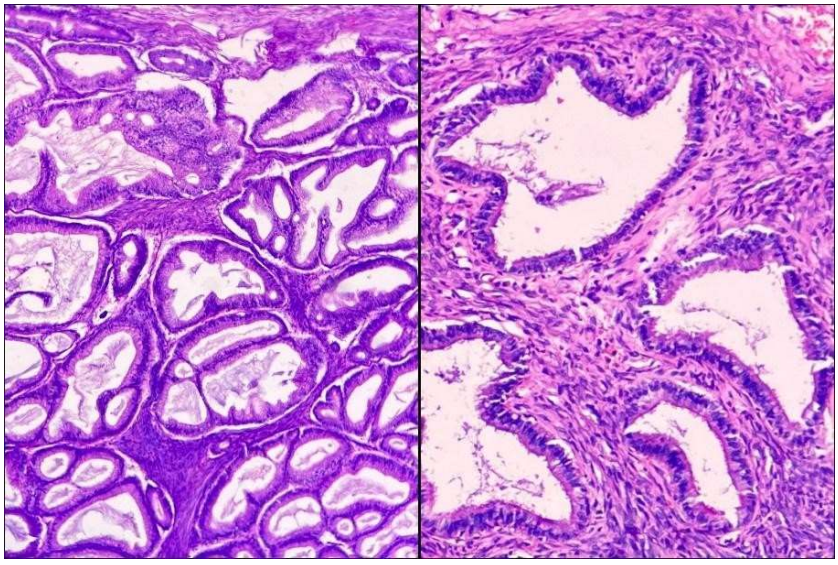

Fig 4B - Microscopy, 10x (H&E): Multiple back-to-back glands with complex architecture lined by intestinal type epithelium, distended by mucin.
Fig 4C - Microscopy, 40x (H&E): Stromal invasion.

FIBROTHECOMA

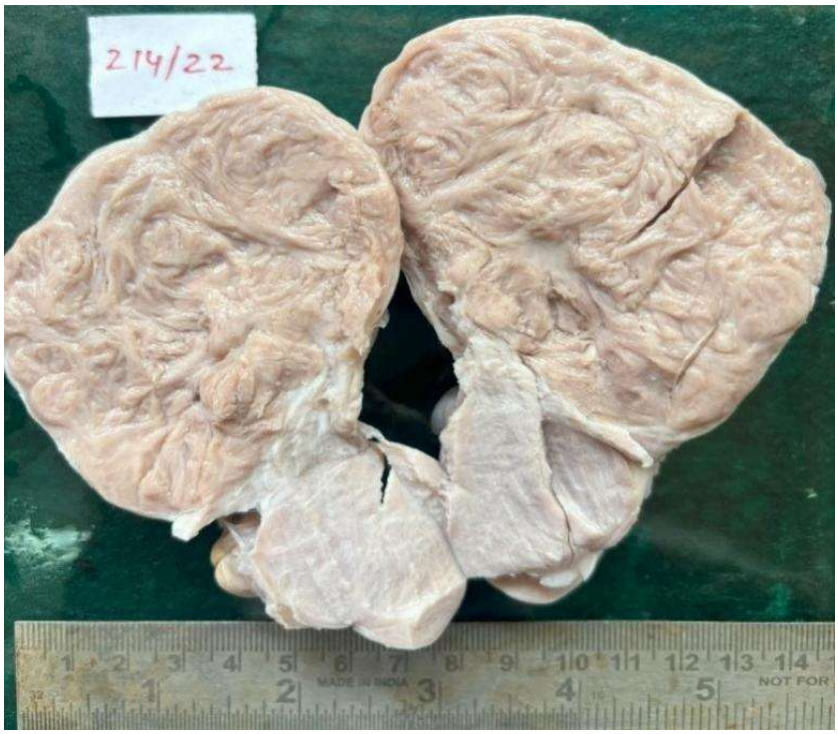

Fig 5A - Gross: Cut section is solid white with trabeculated appearance.

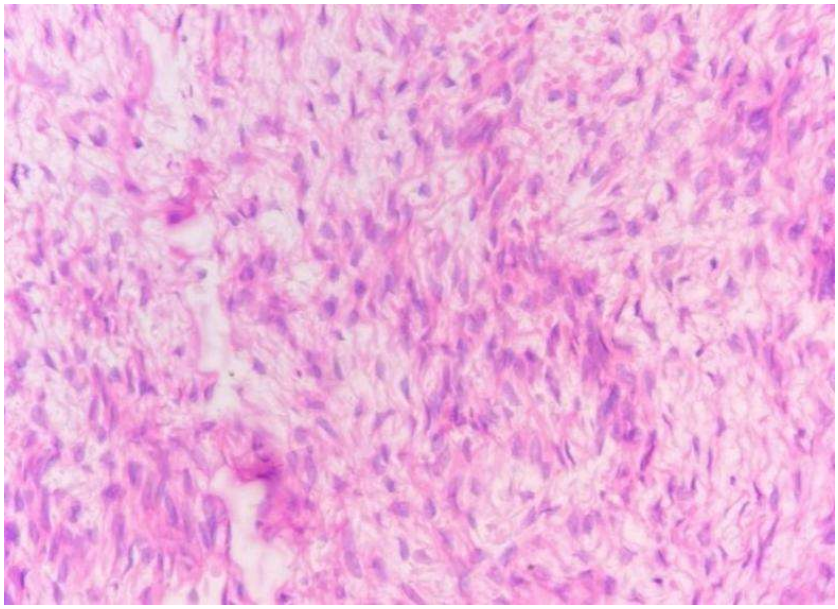

Fig 5B - Microscopy, 40x (H&E): Spindle-shaped cells along with ovoid cells with moderate amount of cytoplasm.

ADULT GRANULOSA CELL TUMOUR

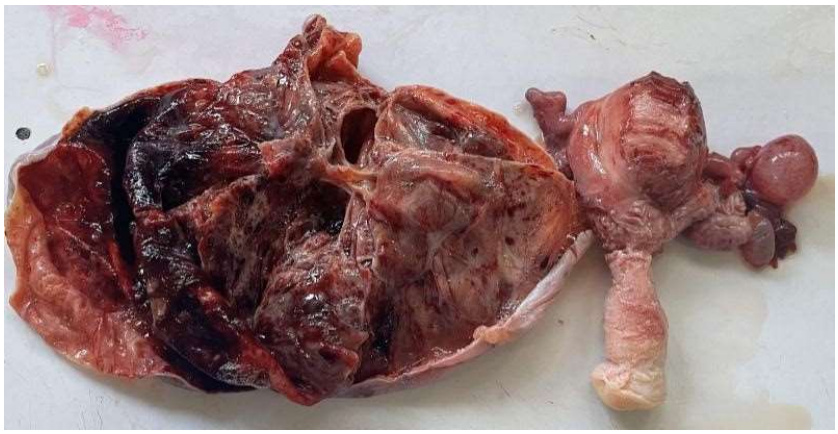

Fig 6A - Gross: Cut surface is solid cystic with areas of hemorrhage.

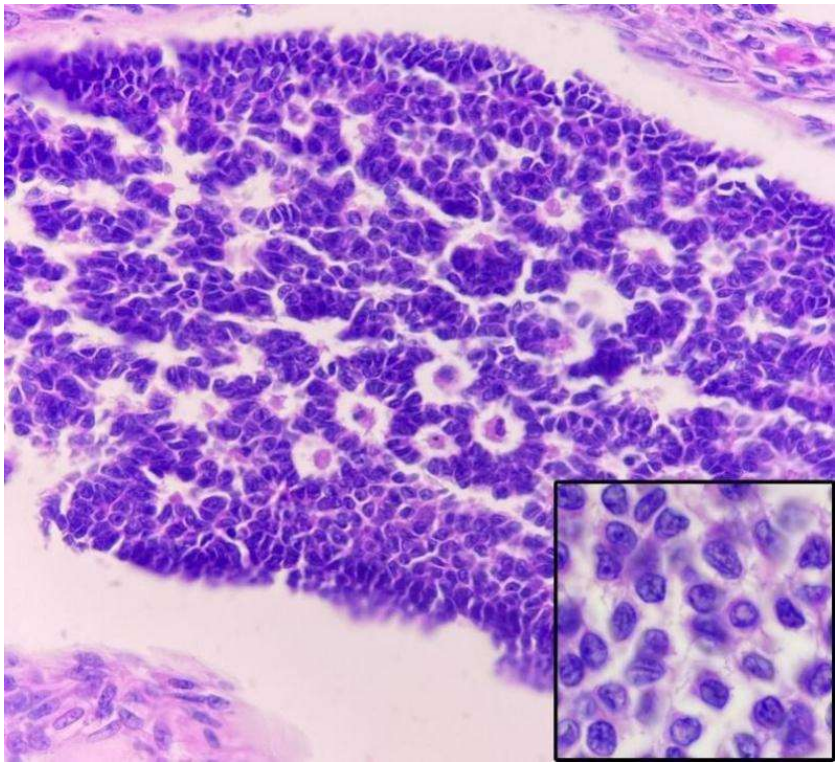

Fig 6B - Microscopy, 10x (H&E): Diffuse area of granulosa cells with many Call-Exner bodies. Inset, 40x (H&E), showing granulosa cells with nuclear grooving (coffee bean appearance) and scant cytoplasm.

STRUMA OVARII

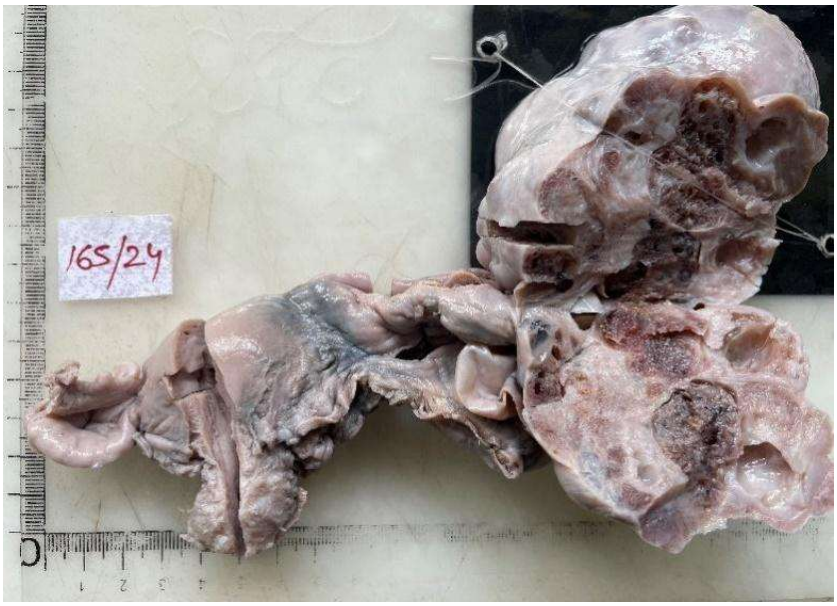

Fig 7A - Gross: Cut section showing reddish brown solid mass.

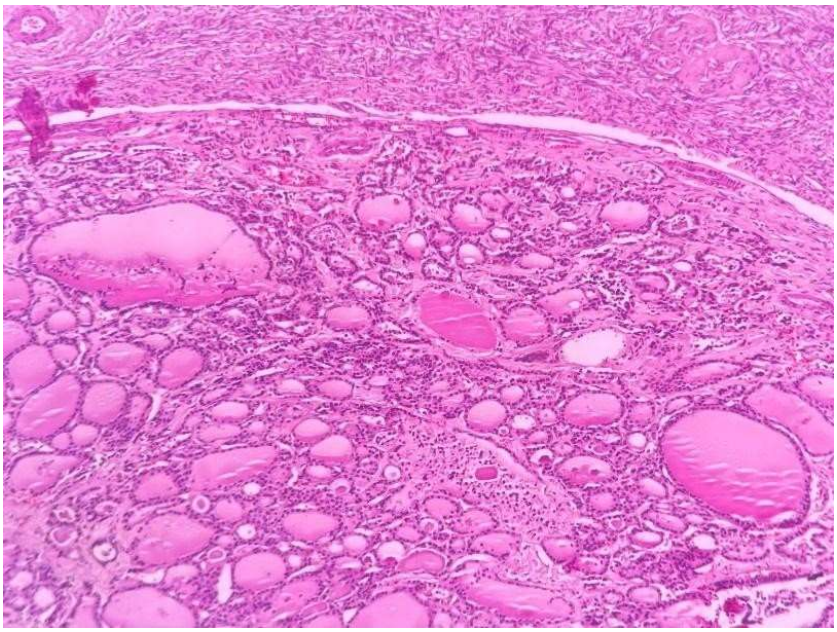

Fig 7B - Microscopy, 10x (H&E): Variable sized follicles filled with colloid embedded in ovarian stroma.

MIXED GERM CELL TUMOUR

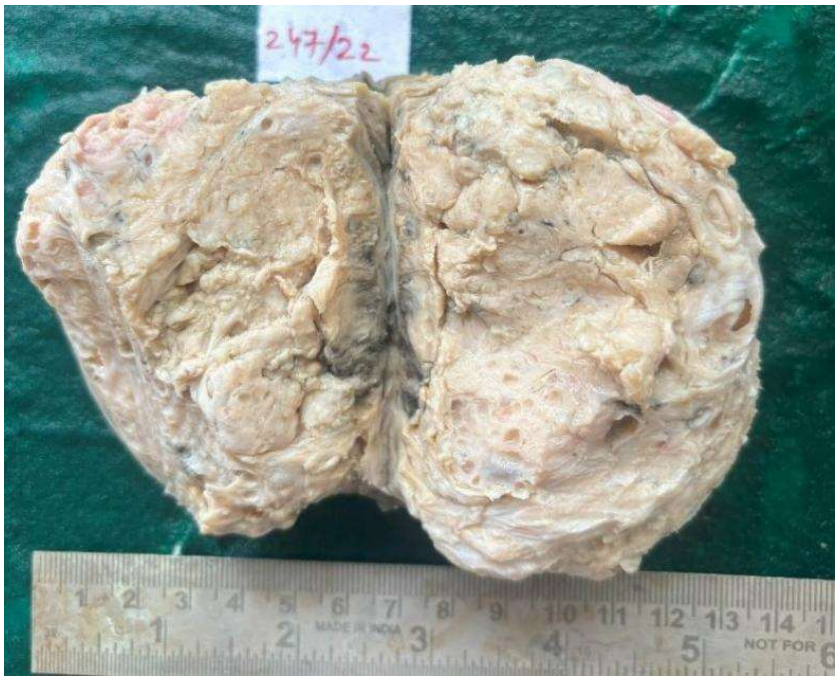

Fig 8A - Gross: Cut surface shows variegated appearance with areas of hemorrhage and necrosis.

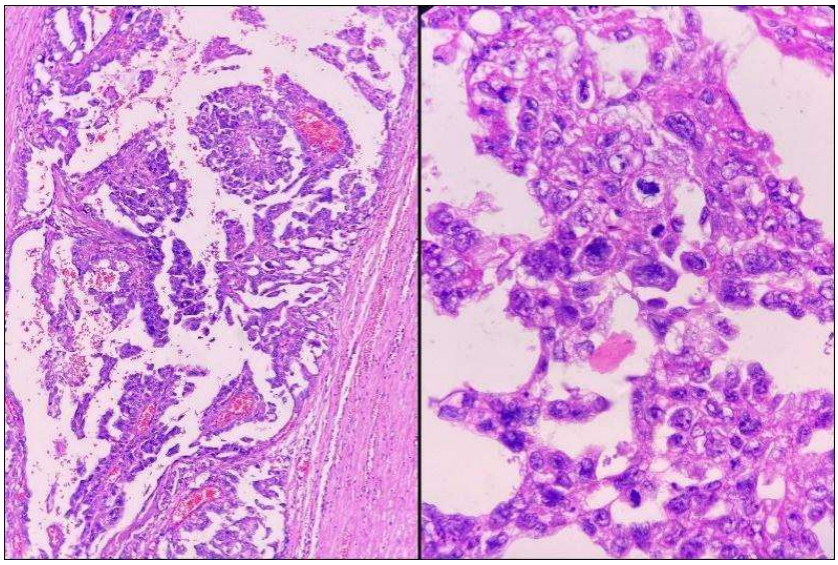

Fig 8B - Microscopy, 10x (H&E): Schiller-Duval bodies (component of yolk sac tumour). Fig 8C - Microscopy, 40x (H&E): Sheets of primitive atypical cells and mitosis (component of embryonal carcinoma).

KRUKENBERG TUMOUR

Fig 9A - Gross: Cut surface of bilateral ovaries showing multinodular grey-white tumour.

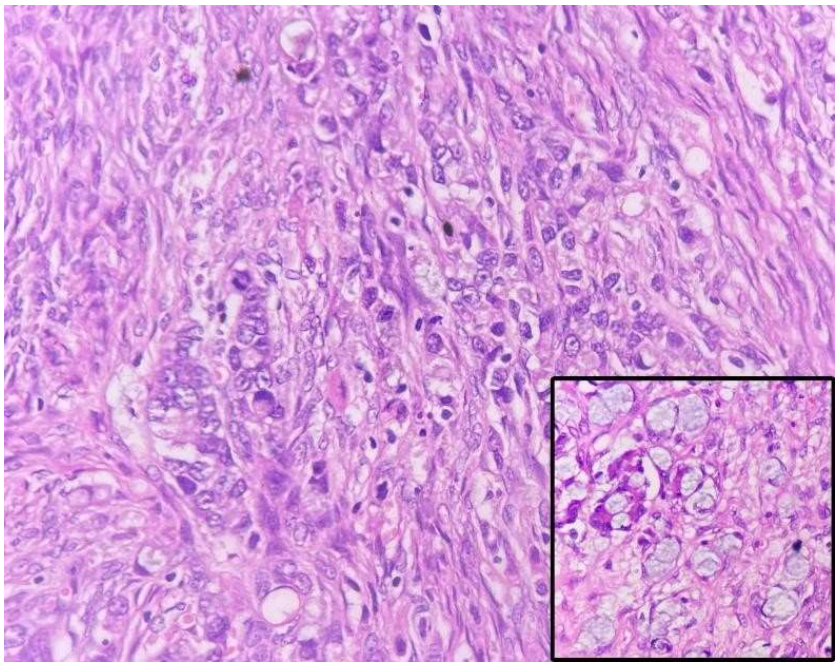

Fig 9B - Microscopy, 10x (H&E): Clusters of signet ring cells infiltrating the spindled stroma. Inset, 40x (H&E), showing signet ring cells containing mucin.