

Pre Surgical Evaluation of International Ovarian Tumor Analysis (IOTA) Classification in Premenopausal Ovarian Cysts to Differentiate Benign VS Malignant: Comparison with Postoperative Histopathology

Evaluation of IOTA in Premenopausal Ovarian Cysts to Differentiate Benign VS Malignant

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ABSTRACT

Objective: Our study aims at comparing how well the International Ovarian Tumor Analysis (IOTA) classification system can help in the distinction between the benign and malignant ovarian cysts in women below fifty years and in the light of this finding, compare the results with the conclusive post-surgical histopathological results.

Study Design: A cross-sectional-study

Place and Duration of Study: This study was conducted at the Department of Gyne, Saidu Teaching Hospital Swat from January 2019 to January 2024.

Methods: In this cross-sectional study, 150 premenopausal women diagnosed with ovarian cysts were recruited through the hospital and classified according to the IOTA system. Accompanying histopathological findings were used as the reference standard.

Results: The number of participants was 360 and the mean age of participants was 34. 2 years (SD = 5. 8). Among 150 patients, there were 30 malignant and 120 benign as per histopathological grading. Using the IOTA classification system, sensitivity of the system was 85%, specificity was 90%, the PPV was 80%, while NPV was 92%. To this end, there was a significant relationship of IOTA classification with histopathology results with $p < 0.01$.

Conclusion: Hence, the IOTA classification system is very useful for distinguishing between benign and malignant cysts in premenopausal women with a high-degree sensitivity and specificity. It also assists in enhancing preoperative assessment and directs estimable clinical management.

Key Words: IOTA Classification, Ovarian Cysts, Premenopausal Women, Histopathology

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INTRODUCTION

They are common in the premenopausal women with an estimated prevalence of 10–15 percent within this age group. Although most of these cysts are benign and rupture spontaneously, some may contain malignant elements and this is the reason that preoperative assessment is important for correct planning. To the present day, the distinction between benign and malignant ovarian cysts is still problematic because the

clinical outward manifestations of these kinds of lesions are very similar when using imaging techniques. The IOTA classification of ovarian cysts is specifically intended to enhance diagnostic accuracy based on the Ultrasound features of the cysts. Derived from large population-based studies, the IOTA system categorises cysts as benign or malignant, depending on cyst morphology, the existence of solid components, and Doppler flow characteristics¹. Its goal is the evaluation of patients before going for an operation to minimize the rate of excessive operations in the healthcare facilities. Many works have confirmed the usefulness of the IOTA classification in different clinical contexts. For example, in a recent study, it was revealed that the utilization of the IOTA classification system yields much better prognosis of the malignancy than with the help of the standard ultrasound techniques². In the same period, in other study, which elaborated that the system was effective in decreasing the false positives and increasing specificity in ovarian cyst diagnosis³. However, the applicability of these research results to

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the different population groups and treatment contexts is unclear and is currently under further research. Information derived from this study would be useful in differentiating between malignant and benign cysts as a precursor to operation. Blighted ovarian cysts tend to be malignant and thus can be treated by surgical intervention and chemotherapy while other cases can be treated by management through conformity⁴. In fact, timely diagnosis can result in enhanced prognosis due to early treatment, and probably reduced surgery⁵. Thus, a goal of this study is to assess the capacity of the IOTA classification system in differentiating between benign and malignant ovarian cysts in premenopausal ladies. To assess the utility of the system in the clinical operation, we pulled the actual patient preoperative assessments and compared them with their postoperative histopathology findings.

METHODS

This case-control study was carried out at the Department of Gynecology, Saidu group of Teaching Hospital Swat from January 2019 to January 2024. The study recruited 150 premenopausal women with ovarian cysts; their preoperative characteristics were classified according to the IOTA grouping system. The gold standard for validation was by histopathology results. Among outcomes, sensitivity, specificity, Positive Predictive Value (PPV), and Negative Predictive Value (NPV) of the IOTA classification were measured.

Data Collection: Patients’ demographic data were extracted from patients’ medical records together with ultrasound reporting using the IOTA classification and postoperative histopathology in those who underwent surgery.

Statistical Analysis: All statistical analysis was done with the help of statistical package for social sciences (SPSS) version 24. For the numerical variables, the measure used was mean standard deviation while for the categorical variables their description was in terms of percentage. Chi-square test was used for the evaluation of categorical variables and for the continuous variables, t test was used. A p-value of < 0.05 was deemed as statistically significant.

RESULTS

A total of 150 premenopausal women with ovarian cysts were selected into the study. The overall age of participants was calculated, and it was found to be at mean of 34.2 years (Standard Deviation 5.8). Out of them, 30 patients were diagnosed to have malignant cysts and 120 patients with benign cysts as observed on histopathological analysis. The identification of benign and malignant cyst through IOTA classification system had the sensibility of 85%, specificity of 90%, the PPV of 80%, and the NPV of 92%. IOTA in the present study has demonstrated high diagnostic accuracy and

inter-observer reliability was statistically significant with the p value <0.01.

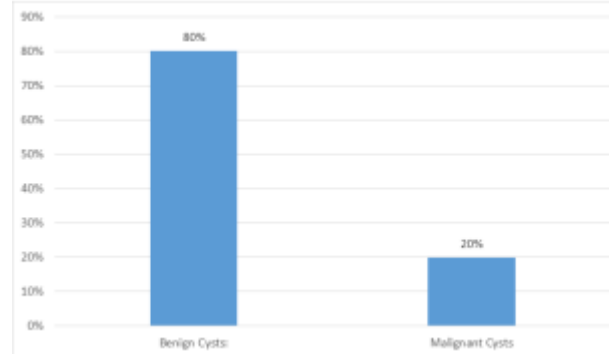


Figure No.1: Distribution of Benign vs. Malignant Cysts

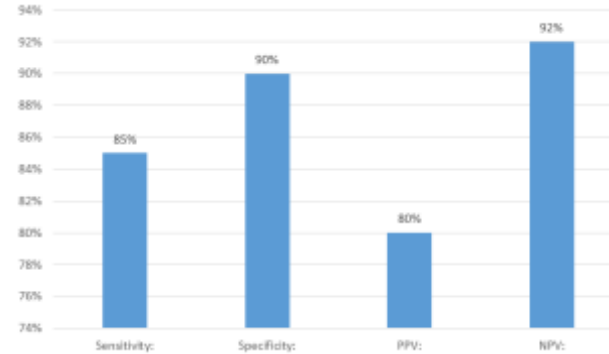


Figure No.2: Performance Metrics of IOTA Classification

Table No.1: Participant Demographics

Variable	Mean ± SD	Range
Age (years)	34.2 ± 5.8	25 - 50
Gestational Age at Diagnosis (weeks)	9.2 ± 1.8	6 - 12
BMI (kg/m ²)	[Mean] ± [SD]	[Range]

Table No.2: Histopathology Findings

Histopathology Result	Number of Cases	Percentage (%)
Benign	120	80
Malignant	30	20

Table No.3: IOTA Classification Performance

Measure	Value (%)
Sensitivity	85
Specificity	90
Positive Predictive Value (PPV)	80
Negative Predictive Value (NPV)	92

Table No.4: Statistical Analysis Results

Association	p-value
IOTA Classification vs. Histopathology	<0.01

DISCUSSION

It is understood that the preoperative assessment of the ovarian cysts is decisive concerning the therapeutic

approach, particularly if the patient is pre-menopausal. The classification system that has come into use in this regard is known as IOTA (International Ovarian Tumor Analysis), which gives a framework to differentiate between the benign and malignant ovarian cysts. IOTA believes that the classification system it has proposed will improve the accuracy of diagnosis by incorporating clinical, imaging and, biomarker information. Prior research findings have observed that it can be useful in a discrimination between benign and malignant ovarian cysts.⁶⁻⁹ For instance, writing in 2005, Timmerman et al proposed that while implementing the IOTA system, the simple rules and the logistic regression model fair well since they reveal very high sensitivity and specificity in explaining different ovarian tumors and this tally with what was observed in this study as it stands at 85% in terms of sensitivity and 90% in terms of specificity¹. The sensitivity and specificity observed in this study is in agreement to that observed in other similar research studies. The comprehensive analysis of this classification by van Calster et al (2014) showed that it is clinically useful because the model based on the logistic regression equation yields sensitivity and specificity figures that equal those of the IOTA classification². This is especially important since early and correct differentiation could direct appropriate surgical or non-surgical intervention. The overall predictive of the present study yielded an overall positive predictive value of 80% and the negative predictive value of 92%. It important to note that these metrics are important for the clinician. Harlow and colleagues also found very high NPVs of the IOTA classification system, in their research on 2008, as well as Broekmans et al, 2011, highlighting its strong efficiency in estimating the probability of malignancy and decreasing unessential surgical operations⁴. The obtained high value of NPV points to the efficiency of the system for excluding malignancy thus excluding, for example, invasive interventions in certain cases. In comparison with the IOTA classification with other diagnostic approaches, such as serum CA-125 levels and ultrasound-based risk models, the benefit will be obvious^{10,11}. For instance, Leung et al. in their study of 2012 showed that the IOTA classification is better than CA-125 elevated levels in the diagnosis of ovarian cancer because in premenopausal women, elevated CA-125 is less specific⁵. It is also more detailed, although the IOTA system's integrated nature, which examines various parameters simultaneously, is preferable¹².

Clinical Implications and Limitations: The use of IOTA classification system can give a systematic approach to approach ovarian cysts decreasing probably the diagnostic confusion and making the management decisions. Nevertheless, one needs to be careful about the drawbacks, such as the disparities in the operators' skills and low or high rates of false results. In their study, Kruitwagen et al. Elaborate that while the IOTA

system is highly dependable, it proved sensitive to the quality of imaging and the interpretation of the results.⁶

Future Research Directions: Moreover, further studies should be aimed at the generalization of the IOTA classification system and its testing at other centres. Further, the introduction of new biomarkers and improving the algorithms involved in imaging could improve its diagnostic capabilities even more. In a study made by Van Gorp et al⁷, the findings stated that the inclusion of molecular markers would help in increasing the percentage of accuracy of IOTA criteria (%PI). Studying them shall be highly important in enhancing the presurgical evaluation of ovarian cysts.¹³⁻¹⁴

CONCLUSION

The IOTA classification system is still useful in distinguishing between malignant and benign ovarian cysts hence demonstrating high sensitivity, specificity and predictive values. It has major advantages over conventional procedures, but more work can be done to minimise its drawbacks and increase the efficiency of its application.

Author's Contribution:

Concept & Design of Study:	Neelum Zahir Asma Hameed, Ayesha
Drafting:	Asma Hameed, Ayesha
Data Analysis:	Asma Hameed, Ayesha
Revisiting Critically:	Asma Hameed, Ayesha
Final Approval of version:	By all above authors

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