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Original Research Article

Role of Ultrasonography and MRI in the Evaluation of Adnexal Masses in Women of Reproductive Age Groups with Histopathological Examination Correlation: A Hospital Based Cross Sectional Study in Barpeta

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Abstract

The prevalence of adnexal mass lesions is 0.17 percent to 5.9 percent in asymptomatic women and 7.1% to 12 percent in symptomatic women of all ages. Differentiating between adnexal structures is a difficult and complex task. Recognising the severity of the problem, the objective is timely and appropriate evaluation and treatment with a positive outcome. The duration of the research was twelve months, from September 1, 2020, to August 31, 2021. Before beginning the investigation, written and informed consent was obtained from the participants. A hospital-based cross-sectional investigation was conducted on 50 patients referred to the Department of Radiology by the Department of Gynaecology at Fakhruddin Ali Ahmed Medical College and Hospital over a 12-month period.

Keywords: Benign, Histopathological examination, Malignancy, Vascularity.

Introduction

The adnexal region within the female pelvis consists of the ovary, fallopian tube, broad ligament, and adjacent non-gynaecological structures. It encompasses the associated vascular and neural networks. Adnexal pathology may manifest in various structures of the adnexa, such as the ovary and fallopian tube, as well as in adjacent organs like the uterus. Less frequently, it may also originate from nongynecological structures, including the bowel and connective tissues [1, 2]. Adnexal masses consistently pose a distinctive diagnostic dilemma, as the identification of benign adnexal masses, which are more prevalent than malignant masses, holds significance in terms of management considerations. Ovarian masses comprise the majority of adnexal masses in medical literature [3].

The ovaries are a bilateral set of female internal reproductive organs, with dimensions of approximately 4 x 2.5 x 1.5 cm each. They are located within the uterine cavity in close proximity to the lateral pelvic wall [4]. The monthly endocrine and traumatic insult that occurs in the ovary during each ovulatory cycle is considered a risk factor for tumour development. Ovarian cancer ranks as the seventh most prevalent cause of cancer-related mortality in women globally. In the context of India, it accounts for approximately 8.7% of cancer cases observed across different regions of the country [5, 6]. In postmenopausal women, approximately 30% of ovarian neoplasms exhibit malignancy, whereas only around 7% of ovarian epithelial tumours in premenopausal patients are unequivocally malignant [4]. The majority of ovarian neoplasms are classified as benign tumours. The majority of malignant tumours are of epithelial origin, while the remaining few are derived from metastasis [7].

The timely identification of adnexal masses, particularly those originating from the ovaries, is crucial for safeguarding both the reproductive capacity and overall well-being of the individual [8]. The elevated mortality rate associated with ovarian tumours can be attributed to the prevalence of late-stage diagnoses among the majority of patients. This poses a challenge for conventional treatment methods, as their efficacy tends to diminish in

advanced stages of the disease. Ultrasonography (US) utilising Doppler technology, Computed Tomography (CT), and Magnetic Resonance Imaging (MRI) are the modalities frequently employed in the assessment of adnexal masses [9]. Ultrasonography is the preferred initial imaging modality for the characterization of adnexal masses due to its cost-effectiveness and lack of ionising radiation exposure [9].

The superior spatial and contrast resolution offered by magnetic resonance imaging (MRI) renders it the preferred modality for the evaluation of adnexal masses in medical practise. The management of ovarian carcinoma is contingent upon various factors, including the patient's age, parity, and the stage of the disease [10]. Benign neoplasms are surgically excised through procedures such as ovarian cystectomy, ovariotomy, laparoscopic cyst dissection in young females, and optimal debulking surgery leading to total abdominal hysterectomy with bilateral scalping-oophorectomy in older females who have fulfilled their reproductive goals [10]. Chemotherapeutic agents, radiation therapy, and hormonal therapy are commonly employed in the management of patients diagnosed with advanced ovarian cancers. The objective of this study was to evaluate and compare the diagnostic precision of ultrasonography and magnetic resonance imaging (MRI) in the identification of adnexal masses among women within the reproductive age range, with a focus on their correlation with histopathological examination (HPE).

Methods

This study collects information from women of reproductive age (menarche to menopause). Menarche, or the first menstrual period, typically occurs two years after thelarche, when growth development is nearly complete and breast development has reached the stage of adult maturity. The definition of menopause is the cessation of ovarian function resulting in permanent amenorrhea. Twelve months of amenorrhea are required to corroborate the onset of menopause. Six patients with adnexal mass suspicion were referred to the Department of Radiology at Fakhruddin Ali Ahmed Medical College and Hospital in Barpeta for ultrasonography and MRI.

Study Period

The investigation was conducted for a duration of twelve months, from September 1, 2020, to August 31, 2021. Before beginning the investigation, written and informed consent was obtained from the participants.

Study Design

My investigation consisted of a hospital-based, cross-sectional analysis of 50 patients referred to the Department of Radiology from the Department of Gynaecology at Fakhruddin Ali Ahmed Medical College and Hospital over a 12-month period.

Case selection

All women of reproductive age suspected of having an adnexal mass and referred to the Department of Radiology at Fakhruddin Ali Ahmed Medical College and Hospital for ultrasonography and MRI were included in the study. Patients' complete medical histories and physical examinations were recorded.

Inclusion criteria

All women of reproductive age groups who are clinically suspected of having an adnexal mass.

Exclusion criteria

- Simple adnexal cyst<4 cm
- Adnexal masses like ruptured ectopic pregnancy and ovarian torsion which are surgical emergencies where the long procedure time of MRI can increase mortality.
- MRI contraindicated patients like metallic implants, prosthesis, aneurysm clips, pacemakers, Claustrophobic patients & gadolinium contrast sensitive patients.
- Patient not giving consent for study or died during the period of study& already diagnosed cases of adnexal masses on treatment.

Statistical Methods

After compiling all of the clinical, pathological, and radiological data, descriptive statistical analysis was performed for this study. To describe the data using descriptive statistics, frequency analysis, percentage analysis, and the mean and standard deviation were used for categorical variables, and mean and standard deviation for continuous variables. In addition, numerous bar charts and pie diagrams were utilised for statistical analysis. Using the Chi-square test for categorical variables and deeming a P value of less than 0.05 to be statistically significant, the relationship between the USG and MRI findings of the pathologies and the final diagnosis is evaluated separately. All of these are accomplished by creating a master chart in Microsoft Excel and analysing it with the appropriate software. Comparing USG and MRI with HPE results, the Receiver Operator Characteristic (ROC) curve analysis was used to determine the sensitivity and specificity. Ultrasonography and MRI's sensitivity, specificity, positive predictive value, negative predictive value, and diagnostic accuracy were compared with HPE and with previous studies.

Results

Out of 50 cases, 38 cases are unilateral (76%), and 12 cases are bilateral (24%) in USG. Out of 50 cases, 29 were unilocular cystic, 9 were multilocular cystic with size<10cm, 1 was multilocular solid<10cm and 11 were irregular multilocular solid size >10cm in USG.Out of 50 cases, 41 cases had no papillary projections (>3mm height) and only 9 cases showed

4 or more papillary projections (>3mm height in USG) (Table 1).

Table 1: Distribution of adrenal masses based on laterality, content, papillary projections in USG

USG laterality	**Frequency**	**Percent**
Unilateral	38	76
Bilateral	12	24
USG content of lesion	**Frequency**	**Percent**
Unilocular cystic	29	58
Multilocular cystic size <10cm	9	18
Multilocular cystic size >10cm	0	0
Irregular solid mass	0	0
Multilocular solid <10cm	1	2
Irregular Multilocular solid >10cm	11	22
4 or more papillary projections (>3mm height) on USG	**Frequency**	**Percent**
Present	9	18
Absent	41	82

Discussion

Over the course of one year, 50 women of reproductive age who were clinically suspected of having adnexal masses were evaluated with USG and MRI, followed by postoperative HPE reports. The final diagnosis was validated through HPE correlation. On HPE correlation, 37 (74%) of 50 adnexal masses in our study were benign, while only 13 (26%) were malignant. This is comparable to the findings of Gupta N. et al. [11] who found 72.9% benign and 22.9% malignant tumours. Saxena et al. [12] reported 77% benign 22% malignant tumours. Our investigation reveals comparable results. According to Sohaib et al. [13], 79.4% of tumours were benign and 20% were malignant. Similarly, this parallels our analysis. Similar to our study, Manivasakan et al. [14] reported 75.2% benign and 21.8% malignant ovarian lesions. 46 (92%) of the 50 adnexal masses were of ovarian origin, while the remaining 4 (8%) were of extra-ovarian origin (3 para-ovarian cysts and 1 hydrosalpinx). Approximately 37 cases (74%) of adnexal lesions in our study were surface epithelial tumours, which is comparable to the findings of Gupta et al. [11], Swamy GG et al. [15], and Bhattacharya et al. [16]. 54% (27 cases) of the epithelial tumours in our study were serous tumours. 38% of serous tumours were benign serous cystadenomas, similar to the findings of Pilli GS et al. [17], who reported 31% of serous cyst adenomas, which is slightly fewer than our findings. It may be owing to the smaller sample size of n=50 in our study compared to n=282 in Pilli GS et al.'s [17] study. In our study, Serous cystadenocarcinoma constitute 14% and mucinous cystadenoma 10%, mucinous cystadenocarcinoma 8%. Similar to Bhuvanesh et al.'s [18] study, we observed 8% germ cell lesions in our research. Similar to the study conducted by Gupta et al. [11], we observed 2% metastatic lesions. Reproductive females between the ages of 15 and 45 were included in our study. Incidence of adnexal masses was highest among those aged 36 to 40, and lowest among those aged 15 to 20. In perimenopausal age groups with a mean age of 36, malignant tumours are more prevalent. The median age of cancer was 36.92 years. Similar incidence was observed in the study by Tiwari et al. [19]. On USG and MRI, unilateral tumours were more prevalent than bilateral tumours. 12 (24%) of the 50 patients studied had bilateral USG lesions, while 13 (26%) had bilateral MRI lesions. On HPE, the majority of bilateral lesions were malignant, consistent with the findings of Pilli GS et al. [17]. USG evaluated adnexal lesions based on content, size, and nature of the mass, papillary projections, septal thickness, Doppler vascularity colour score, presence of ascites, and acoustic shadows, in addition to laterality. According to IOTA's simple principles, malignant characteristics of ovarian masses in USG include irregular solid tumour, irregular multilocular solid tumour >10cm, presence of at least 4 papillary projections, ascites, and colour doppler score 4 (very strong vascularity).

In our study, USG identified 11 cases (22%) with a multilocular solid lesion >10 cm in size, 9 cases (18%) with four or more papillary projections with height >3 mm, 8 cases (16%) with ascites, and 11 cases (22%) with high Doppler vascularity with colour score 4. There were no pure solid lesions detected. USG made a total of 11 (22%) malignant diagnoses and 39 (78%) benign diagnoses. In our study, any adnexal mass with multilocular solid cystic lesions >10cm in size, marked vascularity, 4 or more papillary projections with a height >3mm, and ascites was determined to be highly malignant. In USG, 39 of the 50 examined cases were found to be benign, while 11 were malignant. And 37 were benign and 13 were malignant in MRI. HPE confirmed 13 malignant cases and 37 benign cases. 7 cases of serous cystadenocarcinoma, 4 cases of mucinous cystadenocarcinoma, 1 krukenberg tumour, and 1 case of endometrioid cancer comprised the 13 malignant cases. One case of low-grade mucinous cystadenocarcinoma was missed by

MRI due to the absence of enhancing solid nodules, ascites, or omental/peritoneal/mesenteric metastases.

Conclusion

Adnexal masses are always a diagnostic conundrum, particularly in women of reproductive age, due to their wide differentials and complex appearance, which frequently result in delayed diagnosis and a consequently high mortality rate. Benign lesions outnumber malignant ones. Depending on the patient's age, identifying the imaging characteristics of benign and malignant adnexal masses can alter the therapeutic options available. Ultrasonography is sensitive in detecting lesions and is frequently used as the initial imaging modality for screening adnexal lesions, whereas MRI is reserved for sonographically doubtful cases in which exact lesion characterization is possible by identifying the lesion's content, estimating its extent, spread, and metastasis, and then staging and preoperatively treating the lesion. The greatest concordance was observed between the MRI and ultimate HPE diagnosis. In numerous complex-looking adnexal mass lesions, sonography had a weak correlation with HPE. In our study, MRI demonstrated greater sensitivity, specificity, positive predictive value, negative predictive value, and diagnostic accuracy in identifying adnexal masses than ultrasonography. Sonography with colour Doppler studies should be the first line of investigation for any suspected adnexal lesions because it is readily available, inexpensive, and radiation-free. In cases where sonography is inconclusive or ambiguous, or when there is a discrepancy between sonographic findings and physical examination, MRI should be the investigation of choice.

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