International Journal of Medical and Health Research
ISSN: 2454-9142
Received: 10-07-2019; Accepted: 13-08-2019
www.medicalsciencejournal.com
Volume 5; Issue 10; October 2019; Page No. 36-40

Assessment of suspicious ovarian masses by using USG & CT Techniques

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Abstract
Probable causes of pelvic masses in women which may be found during physical examinations or radiological checking are very conflicting in different age groups. A pelvic mass may have gynaecologic origin or arise from urinary tract or intestines and since pelvic and ovarian masses with benign or malignant types might occur with different percentages at different ages, the importance of primary diagnosis and choosing proper surgical procedure is highly emphasized. Hence based on above findings the present study was planned to evaluate the clinical assessment of suspicious ovarian masses by using USG & CT techniques.

The present study was planned in Department of Radio- Diagnosis, Narayan Medical College and Hospital, Jamuhar, Sasaram, Bihar. From july 2017 to Dec 2017. Total 50 patients of Histo pathologically confirmed cases of malignancies of nose and Para nasal sinuses are studied with regard to their clinical presentation, radiology, histopathology and treatment protocols. All the selected patients were subjected to detailed history, physical examination, ultrasonography and CT scan. Patients with ovarian masses and scheduled for surgery were included in this study, and patients with ovarian masses managed conservatively were excluded. Detailed history of allergy and renal function tests were taken before doing CT scan and if there was history of allergy then non-ionic contrast was used.

USG should continue to be the primary radiological modality in evaluation of ovarian masses even today when cross sectional imaging has largely taken over gynecological imaging. However, if a lesion remains indeterminate on USG or is suspicious for malignant potential, CT is advised as the second radiological modality pertaining to its high sensitivity for evaluating malignant lesion and associated features of metastasis and local disease extent.

Keywords: USG, ct techniques, ovarian masses, benign, malignant, etc.

Introduction

Ovarian cancer is a cancer that forms in or on an ovary. It results in abnormal cells that have the ability to invade or spread to other parts of the body [10]. When this process begins, there may be no or only vague symptoms. Symptoms become more noticeable as the cancer progresses. These symptoms may include bloating, pelvic pain, abdominal swelling, and loss of appetite, among others. Common areas to which the cancer may spread include the lining of the abdomen, lymph nodes, lungs, and liver [1].

The risk of ovarian cancer increases in women who have ovulated more over their lifetime. This includes those who have never had children, those who begin ovulation at a younger age and those who reach menopause at an older age. Other risk factors include hormone therapy after menopause, fertility medication, and obesity. Factors that decrease risk include hormonal birth control, tubal ligation, and breast feeding. About 10% of cases are related to inherited genetic risk; women with mutations in the genes BRCA1 or BRCA2 have about a 50% chance of developing the disease. Ovarian carcinoma is the most common type of ovarian cancer, comprising more than 95% of cases. There are five main subtypes of ovarian carcinoma, of which high-grade serous carcinoma (HGSC) is the most common. These tumors are believed to start in the cells covering the ovaries, though some may form at the Fallopian tubes. Less common types of ovarian cancer include germ cell tumors and sex cord stromal tumors [2]. A diagnosis of ovarian cancer is confirmed through a biopsy of tissue, usually removed during surgery.

Screening is not recommended in women who are at average risk, as evidence does not support a reduction in death and the high rate of false positive tests may lead to unneeded surgery, which is accompanied by its own risks. Those at very high risk may have their ovaries removed as a preventive measure. If caught and treated in an early stage, ovarian cancer is often curable. Treatment usually includes some combination of surgery, radiation therapy, and chemotherapy. Outcomes depend on the extent of the disease, the subtype of cancer present, and other medical conditions. The overall five-year survival rate in the United States is 45%. Outcomes are worse in the developing world [2].

In 2012, new cases occurred in approximately 239,000 women. In 2015 it was present in 1.2 million women and resulted in 161,100 deaths worldwide. Among women it is the seventh-most common cancer and the eighth-most common cause of death from cancer. The typical age of diagnosis is 63. Death from ovarian cancer is more common in North America and Europe than in Africa and Asia [2].

Early signs and symptoms of ovarian cancer may be absent or subtle. In most cases, symptoms exist for several months before being recognized and diagnosed. Symptoms can be misdiagnosed as irritable bowel syndrome. The early stages of ovarian cancer tend to be painless. Symptoms can vary based on the subtype. Low malignant potential (LMP) tumors, also known as borderline tumors, do not cause an increase in CA125 levels and are not identifiable with an ultrasound. The typical symptoms of an LMP tumor can

include abdominal distension or pelvic pain. Particularly large masses tend to be benign or borderline [3].

The most typical symptoms of ovarian cancer include bloating, abdominal or pelvic pain or discomfort, back pain, irregular menstruation or postmenopausal vaginal bleeding, pain or bleeding after or during sexual intercourse, loss of appetite, fatigue, diarrhea, indigestion, heartburn, constipation, nausea, feeling full, and possibly urinary symptoms (including frequent urination and urgent urination) [4].

Use of fertility medication may contribute to borderline ovarian tumor formation, but the link between the two is disputed and difficult to study. Fertility drugs may be associated with a higher risk of borderline tumors. Those who have been treated for infertility but remain nulliparous are at higher risk for epithelial ovarian cancer; however, those who are successfully treated for infertility and subsequently give birth are at no higher risk. This may be due to shedding of precancerous cells during pregnancy but the cause remains unclear. The risk factor may instead be infertility itself, not the treatment [5].

Hormonal conditions such as polycystic ovary syndrome and endometriosis are associated with ovarian cancer, but the link is not completely confirmed. Postmenopausal hormone replacement therapy (HRT) with estrogen likely increases the risk of ovarian cancer. The association has not been confirmed in a large-scale study, but notable studies including the Million Women Study have supported this link. Postmenopausal HRT with combined estrogen and progesterone may increase contemporaneous risk if used for over 5 years, but this risk returns to normal after cessation of therapy. Estrogen HRT with or without progestins increases the risk of endometrioid and serous tumors but lowers the risk of mucinous tumors. Higher doses of estrogen increase this risk. Endometriosis is another risk factor for ovarian cancer, as is pain with menstruation. Endometriosis is associated with clear-cell and endometrioid subtypes, low-grade serous tumors, stage I and II tumors, grade 1 tumors, and lower mortality [5].

Before menopause, obesity can increase a person's risk of ovarian cancer, but this risk is not present after menopause. This risk is also relevant in those who are both obese and have never used HRT. A similar association with ovarian cancer appears in taller people [5].

Ovarian cancer forms when errors in normal ovarian cell growth occur. Usually, when cells grow old or get damaged, they die, and new cells take their place. Cancer starts when new cells form unneeded, and old or damaged cells do not die as they should. The buildup of extra cells often forms a mass of tissue called a growth or tumor. These abnormal cancer cells have many genetic abnormalities that cause them to grow excessively. When an ovary releases an egg, the egg follicle bursts open and becomes the corpus luteum. This structure needs to be repaired by dividing cells in the ovary. Continuous ovulation for a long time means more repair of the ovary by dividing cells, which can acquire mutations in each division [7].

Diagnosis of ovarian cancer starts with a physical examination (including a pelvic examination), a blood test (for CA-125 and sometimes other markers), and transvaginal ultrasound. Sometimes a rectovaginal examination is used to help plan a surgery. The diagnosis must be confirmed with surgery to inspect the abdominal cavity, take biopsies (tissue samples for microscopic analysis), and look for cancer cells in the abdominal fluid. This helps to determine if an ovarian mass is benign or malignant.

Ovarian cancer's early stages (I/II) are difficult to diagnose because most symptoms are nonspecific and thus of little use in diagnosis; as a result, it is rarely diagnosed until it spreads and advances to later stages (III/IV). Additionally, symptoms of ovarian cancer may appear similar to irritable bowel syndrome. In patients in whom pregnancy is a possibility, BHCG level can be measured during the diagnosis process. Serum alpha-fetoprotein, neuron-specific enolase, and lactate dehydrogenase can be measured in young girls and adolescents with suspected ovarian tumors as younger patients are more likely to have malignant germ cell tumors [8].

A physical examination, including a pelvic examination, and a pelvic ultrasound (transvaginal or otherwise) are both essential for diagnosis: physical examination may reveal increased abdominal girth and/or ascites (fluid within the abdominal cavity), while pelvic examination may reveal an ovarian or abdominal mass. An adnexal mass is a significant finding that often indicates ovarian cancer, especially if it is fixed, nodular, irregular, solid, and/or bilateral. 13–21% of adnexal masses are caused by malignancy; however, there are other benign causes of adnexal masses, including ovarian follicular cyst, leiomyoma, endometriosis, ectopic pregnancy, hydrosalpinx, tuboovarian abscess, ovarian torsion, dermoid cyst, cystadenoma (serous or mucinous), diverticular or appendiceal abscess, nerve sheath tumor, pelvic kidney, ureteral or bladder diverticulum, benign cystic mesothelioma of the peritoneum, peritoneal tuberculosis, or paraovarian cyst. Ovaries that can be felt are also a sign of ovarian cancer in postmenopausal women. Other parts of a physical examination for suspected ovarian cancer can include a breast examination and a digital rectal exam. Palpation of the supraclavicular, axillary, and inguinal lymph nodes may reveal lymphadenopathy, which can be indicative of metastasis. Another indicator may be the presence of a pleural effusion, which can be noted on auscultation [5].

There is no simple and reliable way to test for ovarian cancer in women who do not have any signs or symptoms. Screening is not recommended in women who are at average risk, as evidence does not support a reduction in death and the high rate of false positive tests may lead to unneeded surgery, which is accompanied by its own risks. The Pap test does not screen for ovarian cancer [4]. Ovarian cancer is usually only palpable in advanced stages. Screening is not recommended using CA-125 measurements, HE4 levels, ultrasound, or adnexal palpation in women who are at average risk. Risk of developing ovarian cancer in those with genetic factors can be reduced. Those with a genetic predisposition may benefit from screening. This high risk group has benefited with earlier detection [3].

Ovarian cancer has low prevalence, even in the high-risk group of women from the ages of 50 to 60 (about one in 2000), and screening of women with average risk is more likely to give ambiguous results than detect a problem which requires treatment. Because ambiguous results are more likely than detection of a treatable problem, and because the usual response to ambiguous results is invasive interventions, in women of average risk, the potential harms of having screening without an indication outweigh the

potential benefits. The purpose of screening is to diagnose ovarian cancer at an early stage, when it is more likely to be treated successfully [9].

Screening with transvaginal ultrasound, pelvic examination, and CA-125 levels can be used instead of preventive surgery in women who have BRCA1 or BRCA2 mutations. This strategy has shown some success [7].

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Methodology

The present study was planned in Department of Radio-Diagnosis, Narayan Medical College and Hospital, Jamuhar, Sasaram, Bihar July 2017 to Dec 2017. Total 50 patients of Histo pathologically confirmed cases of malignancies of nose and Para nasal sinuses are studied with regard to their clinical presentation, radiology, histopathology and treatment protocols. All the selected patients were subjected to detailed history, physical examination, ultrasonography and CT scan. Patients with ovarian masses and scheduled for surgery were included in this study, and patients with ovarian masses managed conservatively were excluded. Detailed history of allergy and renal function tests were taken before doing CT scan and if there was history of allergy then non-ionic contrast was used.

All the patients were informed consents. The aim and the objective of the present study were conveyed to them. Approval of the institutional ethical committee was taken prior to conduct of this study.

Following was the inclusion and exclusion criteria for the present study.

Inclusion Criteria

1. Only those patients willing to participate in the study were included.
2. Patients referred to the radiology department for ovarian lesions investigation, and found to have positive findings, were included in this study
3. All accidentally diagnosed cases of ovarian lesions were also be included in this study.

Exclusion Criteria: Patients presenting to radiology department not willing for examination or written consent, were excluded from this study.

Results & Discussion

Ultimate diagnosis of an ovarian mass is a common problem in the gynecologic practice. The main clinical problem with this disease is the asymptomatic and undetectable nature of the cancer in the earliest stages. Determination of a degree of suspicion for malignancy in an adnexal mass is the most significant step after identification of the mass. The accuracy of any diagnostic test is of great concern to the gynecologists in making the serious decision either to perform radical surgery or conservative surgery owing to the presence of growing number of conservative therapies and laparoscopic surgical techniques for ovarian tumors [11].

Despite various advances in imaging techniques, ovarian cancer remains to be substantial threat to Indian women being the third most common neoplasm with worst prognosis among all gynecological malignancies [12-13]. Therefore, radiological evaluation is pivotal in characterization of an ovarian mass suggesting the probable etiology of the mass and distinguishing between benign and malignant masses [14]. The results of radiologic assessments helps decide the surgeon about whether the therapeutic approach needs to be surgical or conservative [15].

Transabdominal Ultrasonography remains the study of choice in initial assessment of suspected ovarian masses because it is relatively inexpensive, noninvasive, and widely available. Excellent results of US for recognition of adnexal masses have been confirmed in several studies, which have demonstrated that 60% to 97% of ovarian masses may be visualized sonographically, and 93% to 97% of ovarian masses may be characterized by sonographic morphology [16]. Despite the dominant use of transabdominal sonography to distinguish adnexal masses during the past decade, more women with large, presumed ovarian masses are now being referred for CT scan for mass characterization. When a thick wall, thick septum, papillary projection or solid portion is detected in an ovarian mass on CT, the mass should be considered malignant [17].

Table 1: Type of Masses

	Pre-menopausal	Post-menopausal
Malignant	7	14
Benign	21	8
Total	28	22

Table 2: Test Performance Characteristics of USG & CT

	USG Study (No. of Cases)		CT Study (No. of Cases)	
	Benign	Malignant	Benign	Malignant
Sensitivity	86	62	97	84
Specificity	62	89	92	89
Positive Predictive Value	87	61	96	76
Negative Predictive value	62	85	93	95

Fig 1: USG showing ovarian mass

Fig 2: CT showing ovarian mass

CT is most useful for evaluating the extent of disease in the abdomen and pelvis. In some studies, CT has demonstrated reasonable accuracy in determining which patients may have tumor implants that can be optimally surgically debulked (ie, all tumor nodules greater than 2 cm can be removed) [18-19]. Patients with unresectable disease would undergo percutaneous or laparoscopic biopsy, after which they would undergo chemotherapy and optimal surgical debulking after completion of chemotherapy. Clinical trials have shown that optimal debulking after chemotherapy improves survival rate in these patients.

The principal advantage of MR imaging is that it combines some of the best features of CT and US. The accuracy of MR imaging in the diagnosis of mature cystic teratomas, endometriomas, and leiomyomas is well established and derives from its superb contrast resolution and its usefulness in tissue characterization [20-21]. The identification of these types of masses depends on tissue characterization based on magnetic resonance properties.

Jeong *et al* [38]. examined the accuracy of grey scale ultrasound in delineating a malignant ovarian mass based on size and appearance. In that study fixed septa, tumor size exceeding 5cm, and multiloculations were considered warning for ovarian malignancy. The results of our study showed that morphological characteristics associated with strong probability of malignancy were the presence of solid component (63%), papillary projection (92%), and free fluid in peritoneal cavity (56%). Another study done by Onyka *et al*. showed comparative diagnostic values of grey-scale US versus CT Scan in the primary management of gynecological pelvic mass with emphasis on ovarian cancer detection and staging. The sensitivity of CT scan for all ovarian cancer detection was greater than that of TAUS 83% vs. 67%, but TAUS was more specific. Both methods were equally efficacious in detecting and staging advanced ovarian cancer cases. Over all CT did not offer significant additional features and did not result in a change in management plan in any of the patients reviewed. Both methods were almost equally efficacious in detecting ovarian cancer cases [22].

USG remains the primary modality for detection and characterization of ovarian masses. Major advantages of USG include its easy availability and good morphological characterization. Lesion characters like size, solid/cystic consistency, shape, probable organ of origin and relationship to surrounding pelvic structures are helpful in the decision making process. Majority of ovarian masses can be adequately characterized with US alone. Lesions that are indeterminate, poorly visualised or inadequately localized warrant further characterization by MRI and CT [23-24].

The determination of a degree of suspicion for malignancy in an ovarian mass is the most significant step in its management as the decision to perform radical surgery or conservative surgery depends on accurate pre-operativediagnosis2. Clinical evaluation with regards to site (unilateral or bilateral), fixity, consistency, presence of nodules in Douglas pouch and presence of as cites increase the suspicious of malignancy to certain extent but if combined with other tools as tumor markers and two dimensional ultrasounds, the sensitivity for malignancy increases [25-26].

Among women with ovarian disorders, CT has been used primarily in patients with ovarian malignancies, either to assess disease extent prior to surgery or as a substitute for second look laparotomy. CT is preferred for identification of peritoneal implants, lymphadenopathy and extent of the disease. However, studies failed to demonstrate that CT is significantly superior to other modalities in characterization of ovarian cancer [27-29]. And moreover, simple ovarian cysts are better evaluated by ultrasound. Jeong *et al*. showed that morphological characteristics associated with strong probability of malignancy were the presence of solid component (63%), papillary projection (92%), and free fluid in peritoneal cavity (56%) [30].

Ultrasound and computed tomography plays an important role in the diagnosis, preoperative staging, and evaluation of tumour recurrence of ovarian carcinoma. Ovarian carcinoma has characteristic tumour appearances and modes of tumour spread within the peritoneal cavity. By recognizing these features, the radiologist can assist the clinicians in treatment planning. As benign ovarian tumours greatly outnumber the malignant ones determination of a degree of suspicion for malignancy is critical and is largely based on imaging modalities.

Unfortunately, graded compression Ultrasonography is operator-dependent and requires a high level of skill and expertise. Ultrasonography is also a dynamic investigation, and photographs of sonographic images cannot be reliably re-evaluated. Obese patients and patients with a retrocaecal appendix or with severe abdominal pain are difficult to examine using Ultrasonography [31-32]. A radiologist in this study also indicated that these patient-related factors limited the diagnostic capability of Ultrasonography.

Some studies reported that CT is an accurate way of imaging acute appendicitis [33]. CT is readily available, is supposed to be operator independent and is relatively easy to perform and has results that are easy to interpret.

Conclusion

USG should continue to be the primary radiological modality in evaluation of ovarian masses even today when cross sectional imaging has largely taken over gynecological imaging. However, if a lesion remains indeterminate on USG or is suspicious for malignant potential, CT is advised as the second radiological modality pertaining to its high sensitivity for evaluating malignant lesion and associated features of metastasis and local disease extent.

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