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Original Research Article

## Computed tomography features of benign adnexal mass lesions

Ezzat Khalda<sup>1\*</sup>, Ashok Kumar Mandal<sup>2</sup>, Hafizur Rahman<sup>3</sup>

<sup>1</sup>Department of Radio-diagnosis, Sikkim Manipal Institute of Medical Sciences- Sikkim Manipal University, 5<sup>th</sup> Mile, Tadong, Gangtok, Sikkim, India

<sup>2</sup>Department of Radiodiagnosis, Patna Medical College and Hospital, Patna, Bihar, India

<sup>3</sup>Department of Obstetrics and Gynaecology, Sikkim Manipal Institute of Medical Sciences-Sikkim Manipal University, 5<sup>th</sup> Mile, Tadong, Gangtok, Sikkim, India

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**\*Correspondence:**

Dr. Ezzat Khalda,

E-mail: [ezzyhafiz@gmail.com](mailto:ezzyhafiz@gmail.com)

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### ABSTRACT

**Background:** Adnexal masses originating from gynaecologic and nongynecologic sources may be benign or malignant. The objective of this study was to describe multi-detector computed tomography features of benign adnexal masses for diagnostic accuracy and disease understanding.

**Methods:** Study retrospectively evaluates the multidetector computed tomography features of benign adnexal mass lesions, which were referred for MDCT examination with a primary diagnosis of adnexal masses on clinical or USG. Patients who underwent MDCT and subsequently underwent surgery and proved to benign adnexal mass lesion on histopathological examination were included in this study.

**Results:** Forty five percent benign adnexal mass were in the age group of 36-50 years followed by 32.7% in the age group of 21-35 years. Common presenting symptoms of benign adnexal masses were pain abdomen or pelvic pain (65.5%) followed by mass abdomen (42%) while in one fourth of the patients it was asymptomatic and detected as incidental finding. Pathologic diagnosis of most common benign adnexal mass detected were serous cyst adenoma (54.5%), followed by mature cystic teratoma (18.2%), mucinous cyst adenoma (14.5%) and par ovarian cyst (9.1%). Benign ovarian mass had a characteristic CT appearance of cystic lesion (83.6%), unilocular (65.5%) with regular/well defined and thin wall (83.6%) with occasional septations (21.8%) and papillary projections (14.5%). Ascitis (5.5%) was an uncommon finding of a benign adnexal mass lesion. Computed tomography was most accurate to characterize mature cystic teratoma with a typical cystic lesion having fat deposition and calcifications. Serous cyst adenoma had a CT appearance of thin walled cyst mass with no septations or solid component. Mucinous cyst adenoma ovary had a characteristic multilocular cystic lesion with different fluid attenuation and thin septations. Endometrioma had a variable CT appearance with uni or multilocular cystic lesion and hyperdense lesion with focal calcifications.

**Conclusions:** Multi detector computed tomography may provide accurate and valuable diagnostic information about benign nature of an adnexal mass lesion.

**Keywords:** Adnexal mass, Benign, Computed tomography, Multidetector

### INTRODUCTION

Adnexal masses originating from gynaecologic and nongynecologic sources may be benign or malignant. Of

all the adnexal masses, ovarian pathology is responsible for 70% of adnexal masses found at exploratory surgery on patients with pre-operative diagnosis of pelvic mass, not attributable to leiomyomata.<sup>1</sup> Ovarian cancer is the

fifth leading cause of cancer death in the United States among female population.<sup>2,3</sup>

Primary goal of evaluation of an adnexal mass is to differentiate between benign and more serious malignant conditions. Diagnosis is often delayed for unspecified symptoms, and appropriate treatment plan depend on nature of tumour.<sup>4</sup> Adnexal masses are an important cause for surgery, exact nature of mass is not known until surgery and biopsy have been performed.<sup>5,6</sup>

A detailed history and clinical evaluation and features of the mass will give clue about its nature.<sup>7,8</sup> Additional information can be obtained some invasive and biochemical tests.<sup>9,10</sup>

Thorough pre-treatment assessment by cross-sectional imaging plays an important role in the investigation of suspicious adnexal masses. Imaging helps the surgeon to anticipate nature of the mass before surgery and helps in planning appropriate mode and route of treatment. Laparoscopy has been preferred mode of surgery for benign adnexal masses, whereas malignant nature of tumour can refer or plan the surgery in appropriate cancer centre by expertise. That's is why imaging of utmost importance prior to planning treatment for adnexal masses.<sup>11</sup>

Although transvaginal sonography is often initial choice of evaluation of an adnexal mass and valuable in determining nature of ovarian tumours; but due to overlap features between benign and malignant lesions, additional imaging in the form for CT or MRI is often asked.<sup>12</sup>

A CT scan of pelvis and abdomen can evaluate adnexal mass with possibility of its nature. Using contrast materials CT can help to differentiate from other gastrointestinal masses benign or malignant. Multidetector computed tomography (MDCT) helps multiplanar assessment of pelvic and abdominal structures with two- or three-dimensional illustrations with its high-quality images.<sup>13</sup>

Studies evaluating diagnostic accuracy of spiral CT for nature and extension of the adnexal masses are reported, studies with multi detector CT features of benign adnexal masses are scarce.<sup>14</sup> For better understanding of adnexal masses this study was undertaken with the objective to describe the CT features of benign adnexal masses.

## METHODS

This was a retrospective descriptive study in 2013 the department of Radio-diagnosis, Patna Medical College Hospital, Patna, India from January 2013 to December 2013. Included were patients with suspected adnexal masses who underwent MDCT and later underwent surgery and histopathological examination were analysed. Retrospectively CT features of adnexal masses that were proved benign on histopathology were reviewed.

Excluded from the study were ovarian cysts < 6 cm with clear cyst in reproductive women, non gynaecological origin of adnexal masses, benign adnexal masses in which patient did not underwent CT and ectopic pregnancy. Institutional ethical committee approval was obtained.

All MDCT were performed on GE Bright Speed 16 Slice CT scan machine in the department of Radiodiagnosis, Patna Medical College Hospital. Image scanning parameters were as follows: rotation time 1 second, table speed 15.4 mm/rotation, reconstruction interval 0.6 mm at Kernel H20, 120 kV/260 mAs, acquisition time 9s. MDCT images were obtained from the abdomen and pelvic, covering the area from the diaphragm to the symphysis pubis (craniocaudal). All scans were done with a standard protocol using the triple phase. Pre-contrast scan of the upper abdomen; arterial phase using the Automatic Bolus Tracking System; portal phase yielded with a delay of 60 s after the arterial one. The contrast medium (iohexol) was administered when required at a dose of 1.5 mL per kg, with a variable flow rate of 3-4 mL per second through the antecubital vein of the right arm.

All scans were done with a standard protocol using the triple phase. MDCT images were initially interpreted at work station and reviewed later by an experienced consultant radiologist. An experienced pathologist reported all the resected specimens with no knowledge of the MDCT findings.

## Statistical analysis

The collected data were thoroughly checked, then entered in an Excel spreadsheet (Microsoft, Redmond, WA, USA) for analysis. Data were analyzed using GraphPad Instat version 3 (Graph Pad Software, La Jolla, CA, USA). Results are presented as number and percentages.

## RESULTS

A total of fifty-five cases of adnexal mass proved on histopathology full filled the inclusion criteria. MDCT features of all the 55 cases were retrospectively reviewed to understand MDCT features of benign adnexal masses.

**Table 1: Age distribution of benign adnexal masses.**

Age (years)	Number (n)	%
< 21	5	9.1
21-35	18	32.7
36-50	25	45.5
> 50	7	12.7
<b>Total</b>	<b>55</b>	<b>100.0</b>

Forty five percent benign adnexal mass were in the age group of 36-50 years followed by 21-35 years in which it was 32.7%. Incidence of adnexal mass was low in

women over 50 years (12%) and least in women less than 20 years (Table 1).

**Table 2: Presentation of benign adnexal masses.**

Presenting features*	Number (n)	%
Pain abdomen/pelvic pain	36	65.5
Mass abdomen/abdominal distension	23	41.8
Other symptom	17	30.9
Asymptomatic	14	25.5

\*Some patients had multiple symptoms.

**Table 3: Histopathological types of adnexal masses.**

Histopathology	Number (n)	%
Serous cyst adenoma ovary	30	54.5
Mucinous cyst adenoma ovary	8	14.5
Mature cystic teratoma	10	18.2
Parovarian cyst	5	9.1
Endometrioma	2	3.6

**Table 4: MDCT features of benign adnexal masses.**

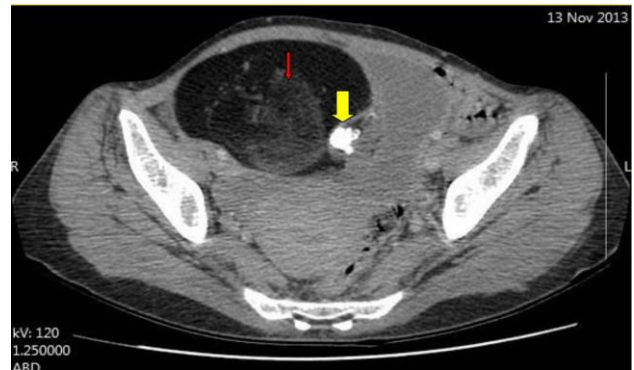
MDCT features	Number (n)	%
<b>Bilaterality</b>		
Bilateral	5	9.1
Unilateral	50	90.9
<b>Consistency</b>		
Cystic	46	83.6
Cystic and solid	5	9.1
Solid	4	7.3
<b>Multilocularity</b>		
Multilocular	19	34.5
Unilocular	36	65.5
<b>Tumour wall</b>		
Thick	9	16.4
Thin	46	83.6
<b>Surface margins</b>		
Regular	49	89.1
Irregular	6	10.9
<b>Cyst definition</b>		
well defined	48	87.3
Ill defined	7	12.7
<b>Septations</b>		
Absent	43	78.2
Present	12	21.8
<b>Papillary growths</b>		
Present	8	14.5
Absent	47	85.5
<b>Ascitis</b>		
Present	3	5.5
Absent	52	94.5

\*MDCT-Multidetector computed tomography.

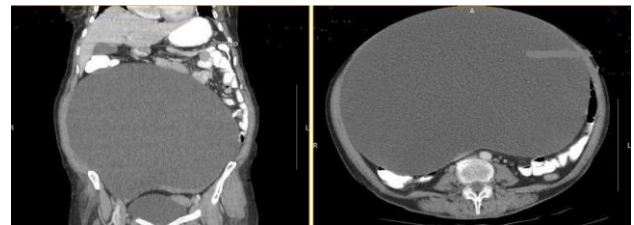
Common presenting symptoms of adnexal masses were Pain abdomen or pelvic pain (65.5%) followed by mass

abdomen (42%) while in one fourth of the patients it was asymptomatic and detected as incidental finding (Table 2). Pathologic diagnoses of benign adnexal masses were most commonly serous cyst adenoma (54.5%), followed by mature cystic teratoma (18.2%), mucinous cyst adenoma (14.5%) and par ovarian cyst (9.1%) (Table 3).

Benign ovarian mass had a characteristic CT appearance of cystic lesion (83.6%), unilocular (65.5%) with regular/well defined and thin wall (83.6%) with occasional septations (21.8%) and papillary projections (14.5%). Ascitis (5.5%) was an uncommon finding of a benign adnexal mass lesion. Ninety one percent adnexal masses were unilateral (Table 4).



**Figure 1: Benign cystic teratoma ovary in a 35-year-old patient showing fat (small arrow) calcifications (big arrow) and cystic area.**

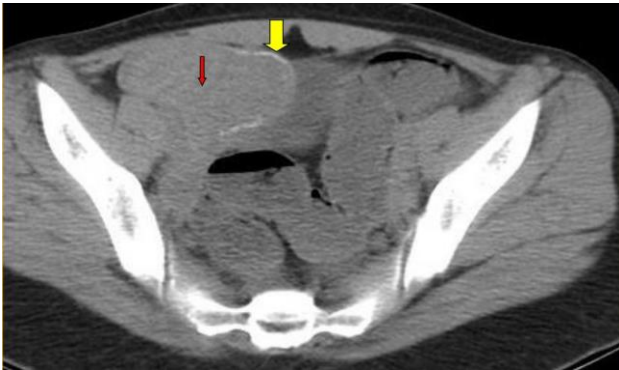


**Figure 2: Serous cystadenoma ovary in a 45-year-old patient. Thin walled cyst with no septation or solid component.**



**Figure 3: Mucinous cyst adenoma ovary in a 20 years old patient- multilocular cystic lesion with different fluid attenuation and thin septations.**

Computed tomography was most accurate to characterize mature cystic teratoma with a typical cystic lesion having fat deposition and calcifications (Figure 1). Serous cyst adenoma had a CT appearance of thin (90%) walled cyst, unilocular mass with no septations or solid component (Figure 2). Mucinous cyst adenoma ovary had a characteristic multilocular cystic lesion (75%) with different fluid attenuation and thin septations (Figure 3). Endometrioma had a variable CT appearance with uni or multilocular cystic lesion and hyperdense lesion with focal calcifications (Figure 4).



**Figure 4: Hyperdense lesion with focal peripheral calcification suggestive of endometrioma.**

## DISCUSSION

Adnexal masses are an important cause of death among female population. Patients with adnexal masses may present with nonspecific vague symptoms. The most common symptoms reported by women with ovarian tumour are pelvic or abdominal pain; distension or mass abdomen.<sup>2</sup> In our study 76% patients presented with pelvic and abdomen pain followed by abdominal distension (59%). Fifteen percent patients were asymptomatic.

The majority of ovarian tumors (60% to 80%) are benign. Although there is a large spectrum of ovarian tumors, there are only a few different histologic types. In one large series of benign ovarian tumors, benign teratomas (58%) and cystadenomas (37%) accounted for the majority of these tumors.<sup>15</sup> In our study epithelial ovarian tumours were found to be the most common histological type representing 69% of the adnexal mass lesions. Benign cystic teratoma are the second most prevalent histotype; forming 18% of lesions, with a marked predominance in the younger age group (< 35 years).

Precise characterization of an adnexal lesion is important as detection of benign or malignant types guides further management; hence, the role of imaging is very important. Modern imaging techniques have demonstrated superiority in the diagnosing and differentiating nature of adnexal tumours compared to older days when exploratory laparotomy was the only option for management of adnexal masses. Therefore,

radiological evaluation is crucial in evaluation of an adnexal mass suggesting the probable aetiology of the mass and distinguishing between benign and malignant masses. Radiologic assessments help decide the surgeon about whether the therapeutic approach needs to be by a general gynaecologist in a local centre or need to be referred to a cancer centre.<sup>16</sup>

Ultrasound is the first choice of investigation to evaluate adnexal pathologies; however, quite often it is unable to differentiate nature of the lesion and asks for further imaging. MDCT can help in characterizing masses and features pertaining to benignity and malignancy can be evaluated.<sup>16</sup>

Mature cystic teratomas, also known as dermoids, are benign germ cell tumors most commonly seen in women of reproductive and are bilateral in 10% to 25% of cases. Although dermoids can occur at any age, but they are commonly seen at younger age group than do epithelial tumors and are the most common ovarian tumors in children.<sup>17</sup> Majority of these tumors contain liquefied fatty material and hairs within the cyst cavity, or there is adipose tissue within the cyst wall or the dermoid plug.<sup>17</sup> The latter, which is a mural solid protuberance, may also contain bone or teeth in up to 25% of cases.<sup>18</sup> Dermoid cysts tend to grow slowly, and 60% of these tumors measure 5 to 10 cm. Rarely, giant dermoids-up to 40 cm-may be encountered.<sup>18</sup> The majority of benign teratomas are found incidentally. In our study 10% dermoid cysts were bilateral and 55% were observed below 35 years of age with cysts varying from 5 cm to 10 cm in size. Sixty percent of dermoid cysts were asymptomatic.

The characteristic CT feature of a mature teratoma is fat within a cystic, often unilocular, encapsulated ovarian lesion. On CT, fat-attenuation values are the diagnostic hallmark of a dermoid.<sup>17</sup> Approximately 8% to 15% of dermoids contain little or no macroscopic fat within the cyst cavity. In these cases, chemical shift imaging may help in finding microscopic foci of fat in the cyst wall or dermoid plug.<sup>19</sup> In our study we observed dermoid cysts are unilocular well defined cystic mass with fat deposition and calcifications with the cysts.

Cystadenomas are the majority of epithelial ovarian tumors. Their frequency increases with age, and after menopause they constitute up to 80% of benign ovarian tumors. Cystadenomas present as thin-walled, unilocular or multilocular cystic lesions filled with serous, mucinous, and sometimes hemorrhagic contents.<sup>20</sup> Serous cystadenomas are bilateral in up to 20% of cases, whereas mucinous cystadenomas are bilateral in only 2% to 3% of cases.<sup>20</sup> In our study 14% serous cystadenoma and 5% mucinous cystadenoma were bilateral with mucinous cysts having larger size than serous ones.

Imaging feature of cystadenomas are cystic ovarian masses with thin, regular walls; thin, enhancing septations (< 3 mm).<sup>20,21</sup> Serous cystadenomas may be



observed as unilocular or bilocular cystic tumors.<sup>21</sup> Small papillary projections may arise from the cyst wall of serous cystadenomas in approximately 20% of cases.<sup>22</sup> Mucinous cystadenomas can have huge size (> 10 cm) and may occupy the pelvis and abdomen. Contrary to serous cystadenomas, mucinous cystadenomas present as multilocular cysts with varying contents on CT.<sup>21</sup> In our study serous cystadenoma were thin walled, unilocular regular cystic lesion. Papillary projections were noted in 14% cases of serous cystadenoma in CT scan.

Endometriotic cysts of the ovaries, also called endometriomas or chocolate cysts are the most common manifestation of endometriosis. Bilateral ovarian involvement occurs in one third to one half of patients.<sup>23</sup> Endometriosis is the most common cause of chronic pelvic pain in women of childbearing age, and up to 30% to 50% of women with endometriosis may be infertile.<sup>24</sup>

Endometrioma present as complex hemorrhagic lesions filled with blood products of different ages, ranging from watery to mucinous to semi liquid chocolate-colored contents. The cyst wall is usually thick and fibrotic and is commonly surrounded by dense adhesions, along with partial or total obliteration of pouch of Douglas.<sup>23</sup> The vast majority of endometriomas range from 3 to 6 cm and rarely exceed 15 cm.<sup>24</sup>

Contrast enhancement CT scan of the pelvis shows unilateral or bilateral irregular, thick-walled, hypodense or hyperdense masses containing multiple irregular thick septa and internal blood clots with partial or complete obliteration of cul-de-sac.<sup>25</sup>

There were a few limitations to our study. First, our study, as a retrospective study, may have selection and verification biases. Secondly, besides the small number of samples, only those patients who were referred for MDCT evaluation were included, which introduces bias. Finally, no inter-observer agreements for MDCT images were done.

## CONCLUSION

Multi detector computed tomography may provide accurate and valuable diagnostic information about benign features of an adnexal mass lesion. MDCT is a non-invasive modality in the detection and characterization of benign adnexal masses.

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