

# Characterization of Benign Ovarian Tumors on MRI: Serous versus Mucinous Cystadenoma

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## A B S T R A C T

**Introduction:** Ovarian lesions are a common entity in the day-to-day clinical practice. A significant proportion of them are formed by benign cystic lesions. The purpose of this study was to evaluate the MR imaging characteristics of serous and mucinous cystadenomas of the ovary and to study the imaging differences between them.

**Materials and Methods:** The study was conducted over a period of 16 months in a prospective manner. A total of 33 patients with a diagnosis of serous or mucinous cystadenoma of the ovary on ultrasound / CT who further underwent an MRI were included in the study. The imaging features were correlated with histopathological findings for all the cases included in the study.

**Results:** The size of the both serous and mucinous cystadenomas are variable and ranged from 2 cm to 15 cm. Both the lesions were common in the age group between 30 and 50 years. With reference to signal characteristics of these tumors, there did not seem to be a definite pattern discernible. Most of the serous cystadenomas were unilocular with no septations contrary to the usually multiloculated mucinous cystadenomas.

**Conclusion:** Even with the overlap in imaging features of the serous and mucinous cystadenoma, an accurate differentiation can be made with considerable confidence if multiple imaging features such as loculations, size, signal intensity and laterality are used. Differentiation based on signal characteristics alone can be misleading and is less specific. No single characteristic was pathognomonic for the histological type.

**Keywords:** Serous, Mucinous, MRI, Ovary

## INTRODUCTION

Ovarian lesions are a common entity in the day-to-day clinical practice. A significant proportion of them are formed by benign cystic lesions. They can range from a simple functional cyst to a cystadenocarcinoma. Many of the ovarian lesions are incidentally detected, where imaging plays an important role in decision of treatment by characterization of these lesions.<sup>1</sup> While the relatively simpler ones do not pose any diagnostic challenges, it is the larger lesions that are always looked upon with suspicion. Serous and mucinous cystadenomas, which are surface epithelial tumors, are two such entities that form a significant proportion of ovarian lesions.<sup>2,3</sup>

Most often, these patients are subjected to MRI to evaluate and rule out a possibility of a malignant change, and or to evaluate the extent of the disease. Both being purely cystic lesions, MRI can, at times, be misleading if not thoroughly evaluated. There are many differences amongst the two that are used as criterion for the characterization. Owing to the scarcity of studies done to evaluate the imaging differences amongst the two entities, there is always a doubt in the mind

of the radiologist.

The purpose of this study was to evaluate the MR imaging characteristics of serous and mucinous cystadenomas of the ovary and to study the imaging differences between them.

## MATERIAL AND METHODS

The prospective and cross-sectional study was conducted in Department of Radiodiagnosis, M.V.J. Medical College and Research Hospital over a period of 12 months. The study was conducted after approval from the Institutional Ethics Committee. Only those patients with clinical or sonographic diagnosis of either serous or mucinous cystadenoma of the ovary were included in the study. Only benign entities were included. Patients who had imaging features suspicious for malignancy were excluded from the study. The imaging findings were correlated with histopathological findings. Written informed consent was obtained from all the eligible patients in the vernacular language. In the case of a patient being a minor, the consent of the guardian was obtained.

### Inclusion criteria

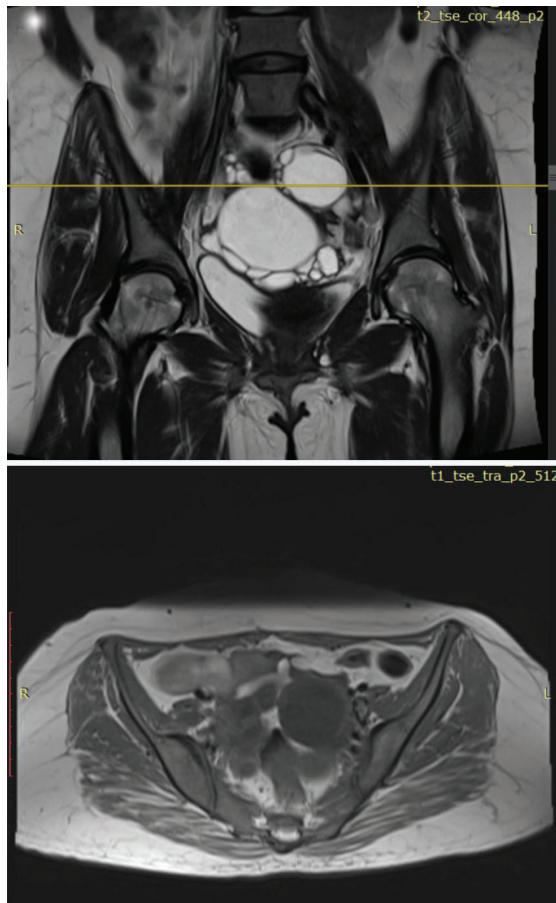
Patients with a diagnosis of either serous or mucinous

cystadenoma of the ovary by clinical or ultrasonography were included (figure-1,2). Only histopathologically proven cases were included.

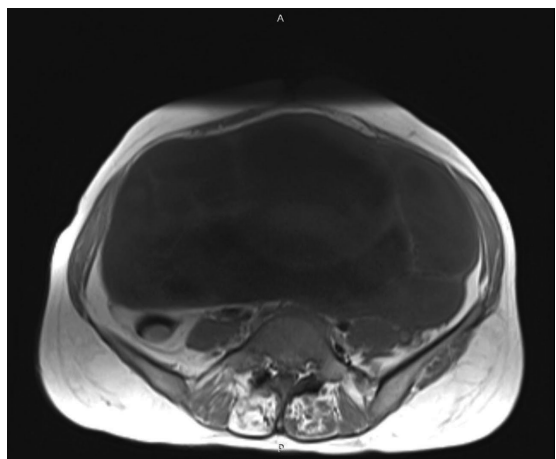
#### Exclusion criteria

Pregnant patients, patients with known or suspicious ovarian malignancy were excluded.

A total of 33 patients were taken into the study, but 1 was excluded as there were borderline malignancy features on histopathology.



**Figure-1:** Left – T2W Coronal MRI showing bilateral serous cystadenomas; Right – T1W axial image showing a serous cystadenoma



**Figure-2:** T1W Axial MRI image showing mucinous cystadenoma

The study sample was evaluated with a 1.5 T MRI (Siemens Magnetom Essenza). A routine protocol of MRI pelvis was followed which included

- T1 and T2 W Axial sequences with the imaging plane perpendicular to the uterine cavity
- T2 W Coronal sequence with the imaging plane parallel to the uterine cavity
- A T1W Fat suppressed sequence was included if any hyperintensity was noted on the native T1W images
- Gadolinium (Gadodiamide) enhanced T1W Axial and coronal sequences

Imaging was done with the patient in fasting state for at least 4 hours in moderately filled urinary bladder.

The MRI images were interpreted by 2 experienced radiologists, both with an experience of at least 5 years in interpreting Pelvic MRI. The evaluation was done with the following criteria: Size of the lesion, sidedness/laterality, septations (number and thickness), and signal characteristics of the fluid.

### STATISTICAL ANALYSIS

The data obtained from the study was complied with Microsoft Excel (2016 version) and further analysis was done with SPSS version 24.0, results were expressed in percentages and data presented in the form of graphs and tables.

#### Results:

In the study, 33 patients were evaluated by MRI and subsequent histopathological evaluation of the ovarian cystic lesion. 1 of them was excluded due to the possibility of a borderline malignancy on histopathological evaluation. Both the lesions were common in the age group between 30 and 50 years. Serous cystadenoma was more common in the 4<sup>th</sup> decade (40% of cases), while mucinous cystadenoma was found to be common in the 5<sup>th</sup> decade (58.3% of cases). Overall, serous cystadenoma was commoner (60.6% of cases). Incidence of both, less than 20 years and more than 50 years were rare (Table 1).

The size of the both serous and mucinous cystadenomas were variable and ranged from 2 cm to 15 cm. However, the serous tumors were smaller (Average size: 4.9 cm) in comparison to the mucinous cystadenomas (Average size: 8.3 cm)

Lesions involving bilateral ovaries were seen to be more in case of serous cystadenomas (20% of cases) in comparison to just 1 case of mucinous cystadenoma in the present study. Most of the lesions (serous and mucinous) were unilateral and seen involving the right ovary.

Most of the serous cystadenomas appeared hypointense on T1 weighted MR sequence and hyperintense on T2 weighted sequence, there were few (6 cases) which appeared hyperintense on T1 weighted MR sequence. The signal intensity of the lesion in entirety was more homogeneous in serous tumors while the mucinous counterparts showed heterogeneity in signal intensities. (Table 2)

Most of the serous cystadenomas were unilocular with no septations (80% of cases), contrary to the mucinous cystadenomas in which 83.3% of cases were multilocular with internal septations. In case of serous cystadenoma, the septae, if present were thicker in comparison to the mucinous cystadenoma.

Age (years)	Serous cystadenoma	Mucinous cystadenoma
≤20	1 (5%)	0 (0%)
21-30	3 (15%)	0 (0%)
31-40	8 (40%)	4 (33.3%)
40-50	6 (30%)	7 (58.3%)
>50	2 (10%)	1 (8.3%)
Total	20 (100%)	12 (100%)

**Table-1:** Age distribution of serous and mucinous cystadenomas

	Serous cystadenoma	Mucinous cystadenoma
Age	4 <sup>th</sup> decade	4 <sup>th</sup> decade
Signal intensity		
T1 W		
Hypointense	14 (70%)	5 (41.6%)
Hyperintense	6 (30%)	7 (58.3%)
T2 W		
Hyperintense	20 (100%)	5 (41.6%)
Hypointense	0 (0%)	7 (58.3%)
Septations	4 (20%)	10 (83.3%)
Involvement		
Unilateral	16 (80%)	11 (91.6%)
Bilateral	4 (20%)	1 (8.3%)
Papillary projections	2 (10%)	0 (0%)

**Table-2:** Imaging properties of serous and mucinous cystadenomas

Papillary projections, which are generally considered suspicious for malignancy, were found in 10% of the serous cystadenomas and they did not have malignant properties on histopathological evaluation.

#### Discussion:

Benign cystic tumors of the ovary are the most common tumors of ovary. Serous and the mucinous cystadenomas comprise the majority of cases. Magnetic Resonance Imaging, with its superior tissue characterization abilities proves as an excellent tool in evaluation of such cystic ovarian lesions.<sup>4</sup> Ultrasound, though sufficient in many cases, has its disadvantages in cases of large lesions due to the limited field of view. MRI has shown to have a sensitivity of 100% and specificity of 94% in the evaluation of sonologically indeterminate lesions of the ovary.<sup>5</sup>

Serous and mucinous cystadenomas were most commonly seen in the 4<sup>th</sup> and 5<sup>th</sup> decade of life respectively. This is comparable with previous studies by Hatwal et al<sup>3</sup>, Modi et al<sup>6</sup> and Ghosh et al.<sup>7</sup>

Serous cystadenoma was found to be commoner than mucinous cystadenoma in our study which followed a similar pattern as compared to previous studies done by Prakash et al<sup>8</sup>, Mondal et al<sup>9</sup> and Iqbal et al.<sup>10</sup>

Most of the serous cystadenomas appeared hypointense on T1 weighted MR sequence and hyperintense on T2 weighted sequence, there were few (6 cases) which appeared hyperintense on T1 weighted MR sequence. The signal intensity of the lesion in entirety was more homogeneous in serous tumors while the mucinous counterparts showed heterogeneity in signal intensities. With reference to signal

characteristics of these tumors, there does not seem to be a definite pattern discernible. The signal properties of mucinous cystadenoma were relatively inconsistent. Thus, the characterization based on signal intensity proved to be less specific for the tumor type. This could be due to the difference in protein content of the cyst fluid or hemorrhage into the cyst.

MRI features of a unilocular cystic lesion with absent or few loculations, thin wall and homogeneous signal intensity were more in favor of a serous cystadenoma. Mucinous cystadenomas were comparatively ( $p < 0.001$ ) larger in size, multilocular cystic lesion with thick walls and a heterogeneous signal intensity.

#### Limitations of the study include:

- Small sample size
- Case selection bias (as it is a hospital based study)
- Imaging spectrum of suspected malignancies are not included

## CONCLUSION

With vast advances in imaging technologies occurring by the day, the information that can be obtained from them also has to be effectively interpreted. With the additional information being available, the onus is on the radiologists to make such an information more valuable.

Even with the overlap in imaging features of the serous and mucinous cystadenoma, an accurate differentiation can be made with considerable confidence if multiple imaging features are used. Differentiation based on signal characteristics alone, as is sometimes done, can be misleading and is less specific. No single characteristic was pathognomonic for the histological type of cystic tumors in discussion.

Preoperative knowledge of the possible presence of mucinous contents within an adnexal lesion is of importance. The operating surgeon can be advised to be more cautious during the excision of such a tumor to prevent the intraperitoneal spillage of the mucinous contents, which has a tendency to develop into Pseudomyxoma peritonii.

In addition, inching closer towards histological subtypes on MRI can instill confidence in the referring surgeon.

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