Original Research Paper

ABSTRACT

## Radiodiagnosis

# MAGNETIC RESONANCE IMAGING IN THE EVALUATION OF FEMALE PELVIS

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Introduction: Magnetic resonance imaging (MRI) is an excellent non-invasive technique to evaluate the female pelvis due to its high spatial resolution, excellent tissue contrast and multiplanar imaging capability. Radiologists often evaluate a wide range of pelvic masses and various congenital anomalies.

Objective: Aim and objective of the study is to evaluate the importance of MRI in the pelvic masses and to characterize the MRI findings in female pelvic masses.

Material & Methods: We prospectively performed MRI in our institute in 57 patients which detected pelvic pathologies or pelvic masses on clinical examination and/or ultrasonography. These lesions were examined for size, shape, signal intensity, character and post contrast enhancement. Secondary signs such as ascites, lymphadenopathy and invasion of the adjacent organs were observed.

Results: MRI was significantly superior in the evaluation of the tumor extension, myometrium invasion, detection of lymph nodes and parametrium involvement. Bladder and anorectal carcinoma can also be well detected on MRI. Various benign tumors of uterus, congenital anomalies can also be seen.

Conclusion: MRI is an excellent investigating technique to evaluate the female pelvic masses due to its high spatial resolution, excellent tissue contrast and multiplanar imaging capability. It is very good modality for the tumor staging and follow-up the cases.

# KEYWORDS : Fibroid, ovary, uterus, tumors, hemorrhage.

## INTRODUCTION

Ultrasound is the first modality of choice for evaluation of female pelvis. How ever there are many shortcomings of this modality such as limited field of view, bowel gases obscuring the pelvic organs. Pelvic masses commonly arise from uterus, cervix, ovaries and fallopian tubes. In addition pelvic masses may arise from the urinary system, gastrointestinal system, adjacent soft tissues and metastases. Current indications for MRI of the female pelvis include local staging of biopsyproven cervical or endometrial cancer. Characterization of ovarian masses and presurgical assessment of benign gynaecologic conditions such as poly fibromatosis, large uterus and complex uterine malformation and those responsible for chronic pelvic pain, such as endometriosis and adenomyosis are also evaluated on MRI

The site of origin, imaging characteristics and clinical history may all help to narrow the differential diagnosis. MRI is very helpful in work up of these lesions, their location ,origin and relationship to adjacent organ, peritoneal or extraperitoneal involvement, lymph nodes, and lateral pelvic wall involvement . The application of MRI in pelvic masses goes beyond lesion detection to the extension of mass and assessment of disease staging. Establishing correct diagnosis and accurate staging is important to plan the treatment of the patient. This article presents a pictorial as well as literature review of MRI images of such pelvic masses

## **MATERIAL & METHODS**

We prospectively performed MRI in 57 patients over the period of one year who were detected to have pelvic pathology. All MRI were done on 1.5 Tesla Siemens machine. Axial images were obtained using 256\*256 matrix, 32 cm field of view and 4 mm slice thickness. Coronal  $T_{\rm 2}\text{-}$  weighted image ( $T_{\rm 2}W_{\rm 1}$ ) and short  $T_1$  inversion recovery (STIR), sagittal  $T_2W_1$  and axial  $T_2W_1$  $T_{_1}W_{_1}$  and STIR images were taken. Fat-suppressed  $T_{_1}W$ sequences of gadolinium were taken wherever needed. These lesions were examined for size, shape, signal intensity, character and post contrast enhancement. Secondary signs such as ascites, lymphadenopathy and invasion of the adjacent organs were observed.

For any MRI of the pelvis the patient is asked to fast 3 to 6 hours before the examination. She should not urinate for 1 to 2 hours before the examination to allow a moderately filled bladder. Ideally the coil position should allow imaging from mid symphysis pubis to renal hilum without changing its position. A patient interview before preparation should cover the location and intensity of pelvic pain.

#### OBSERVATIONS

MRI was significantly superior to ultrasound in the evaluation of the tumor extension, myometrium invasion, detection of lymph nodes and parametrium involvement.

There were 14 patients detected with uterine fibroid, 2 patients had adenomyosis, 5 patients of cervical carcinoma, 5 patients of endometrioma, 3 cases of hydro salpinx, 3 patients of ovarian carcinoma, 4 cases of hemorrhagic ovarian cyst, 3 cases of complex ovarian cyst, 1 patients of vaginal mass, 2 cases of endometrial hyperplasia,3 patients of simple ovarian cyst, 2 patients of PCOD, 2 patients had anorectal wall thickening, 1 patient of uterine polyp with urinary bladder diverticulum, 1 patient of pelvic inflammatory disease, 1 patient of septate uterus, 4 patients had uterine agenesis and l patient had arteriovenous malformation with hematometra.

14 patients were detected with fibroid. Most of them had intramural fibroids, 2 patients had subserosal fibroids. 1 patient had submucosal fibroid and 1 had broad ligament fibroid. Most of the patients with large fibroids had central cystic and necrotic degeneration. On MRI fibroids were seen as sharply marginated homogeneous areas of low signal intensity on T2 sequences and isointense to myometrium on T1 sequences. Thin hyperintense rims are some times seen, as well as internal signal heterogeneity due to hyaline on myxoid degeneration.

2 patients had large anorectal carcinoma invading posterior wall of vagina.

Two patients had adenomyosis on MRI. They were seen as thickening of endometrial myometrial junctional zone forming an ill-defined low signal intensity lesion on T2W images.

Five patients had cervical carcinoma in different stages. Two patients had cervical mass confined to cervix , seen as thickening of anterior and posterior wall of cervix .On histopathology examination cervical carcinoma was detected. Rest of the 2 patients had stage IIB according to FIGO classification and one had stage IIIA. None had the significant pelvic or inguinal lymphadenopathy.

Two patients had endometrial hyperplasia. Thickness of endometrium was 24.8 mm and 16.7 mm respectively.

5 patients had endometriosis. There are complex cystic masses seen in the ovaries appearing hyperintense on T1 and FAT SAT images. The lesions are mildly hypointense on T2 images s/o shadowing . The lesions are showing mild blooming of their walls on GRE images 3 patients had bilateral ovarian masses .2 patients had bilateral involvement with lesions appearing hypo intense T1 and mixed signal intensity on T2W images. Mild to moderate free fluid is seen with associated peritoneal thickening and omental caking . In one patient there is altered signal intensity lesion seen involving right sacral ala appearing hypointense on T1 and hyperintense onT2W images s/o bony Metastases.

Three patients had complex ovarian cyst comprising of multiple septa and soft tissue nodular lesions.

Simple ovarian cyst is seen in three patients .On MRI thin walled cyst lesion which is hypo intense on T1 and hyper intense on T2 with no internal solid component.

Hemorrhagic cyst was seen in 4 patients.Well defined cystic lesions showing heterogeneously hyperintense signal on both T1 W and T2W images in adnexal region.

2 patients had PCOD. The cysts show uniform high signal on T2W images . Hypertrophied ovarian stroma is depicted as broad central areas of low T1 and T2 signal intensity.

l patient had vaginal mass reaching upto the perineal surface. Mass is hypo intense on Tl and hyper intense on T2W. Uterus is post-menopausal atrophic.

One patient had endometrial polyp with large bladder diverticula. Uterus is post-menopausal atrophic and shows a well-defined rounded hypo intense lesion measuring 25\*17 mm in endometrial cavity.

One patients had pelvic inflammation, multiloculated large fluid collection seen in the pelvis with multiple internal septations appearing hypo intense on T1 and hyper intense on T2W images.

Two patients had bilateral hydrosalpinx. Tubular cystic lesion was seen in bilateral adnexal region abutting the ovaries .The lesion appearing hypo intense on T1 and hyper intense on T2 images.

Four patients had congenital agenesis of uterus. Two patients had presence of vaginal vault and both ovaries were present . In other two patients uterus and ovaries were absent .

One patient had septate uterus .The uterus is bulky in size and Shows heterogenous signal intensity. Two endometrial Cavities are seen completely seperated by a hypo intense fibrous septum extending into the endo cervical canal. One patient had uterine arteriovenous malformation.Uterus is bulky with multiple flow related signal voids within the myometrium and adjacent parametrium. Endometrial cavity is distended and appears mildly hyper intense on T1W images and hypo intense on T2w images and shows blooming on GRE images s/o hematometra.





heterogeneous mass lesion seen arising from anterior and posterior The lesion is appearing hypointense on t1 and hyperintense on t2w images with central cystic /necrotic degeneration.

Fig(2)(i) T2 tse tra Fig(2)(ii) T2 tse sag Hypointense signal intensities on both T1 and T2 W images. Representing subserosal and submucosal uterine fibroid with dd of endometrial polyp. mycometrium s/of biroids.

#### DISCUSSION

Leiomyoma is smooth muscle cell arranged in whorl like pattern of various amount of fibrous connective tissues, collagen, extra cellular matrix. Localization, thickness of stalk, vascularity -needs to be mentioned. Degenerationincluding hyaline or myxoid degeneration, calcifications, cystic and red degeneration is related to lack of blood supply and is more commonly found in postmenopausal women. Majority of fibroids are in uterine corpus. Few of them are in cervix and broad ligament. Fibroid can be within the uterus as submucosal, intramural and subserosal types. Clinically it can be silent or present as abnormal uterine bleeding, infertility or pelvic pain.

Leiomyoma is isointense on T1 and hypo intense on T2 to myometrium. On hyaline degeneration or calcification exhibits low signal intensity on T2W. In cystic and myxoid degeneration, central high signal intensity on T2 weighted images is seen. Hemorrhagic fibroid is seen as high signal intensity mass on T1 weighted images. Large fibroid may display mass effect and feeding serpiginous vessels in the periphery. Treatment is by surgery or uterine artery embolization.

Adenomyosis , ectopically located endometrial gland and stroma within the myometrium adjacent to myometrial hypertrophy. Pre and peri menopausal females are involved . It can be either focal or diffuse . There is ill defined thickening of low signal T2 band surrounding the endometrium, this is junctional zone . If the junctional zone is > 12mm, it is diagnostic of adenomyosis, if <8mm adenomyosis is excluded . Clinically it may present as abnormal uterine bleeding , dysmenorrhea and pelvic pain. Foci of high signal intensity measuring 2 to 6mm within the low signal intensity areas are seen in 50% of cases on T2 weighted images and represent endometrial cysts, glands or haemorrhagic foci . Focal adenomyosis appear as localize T2w low intensity signal mass (adenomyoma) within myometrium arising from junctional zone with ill defined edges.







Fig (3) T2 tse sag

Asymmetric thickening of the myometrium and apjunctional zone, more so along the right lateral myometrium with associated mild 11/12 hypo intensity of the myometrium representing adenomyosis.

Fig (4)(17 2 tie sag Fig (4)(17 2 tie sag Heterogeneous altered signal imFrag (4)(17 2 tie tra Heterogeneous altered signal imFrag (4)(17 2 tie tra Heterogeneous altered signal imFrag (4)(17 2 tie tra and appearing hypointense on T1 and mildly hyperintense on T2W images lateral The mass has irregular / spiculated margins. The mass is extending into the bilateral parametrial regions with discontinuity of the cervical stroma. The g mass is also involving the lower uterime body with fluid distending the endometrial cavity- ca cx.

Endometrial polyp is benign tumor of endometrial cavity, where they may be broad based, pedunculated or attached to endometrium by thin stalk. They develop into focal overgrowth of endometrial tissues with endometrial glands, stroma and blood vessels. It is most common after 40 yrs of age. On MRI it

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displays an intermediate signal intensity on T1w and heterogeneous signal intensity on T2. Central fibrous core of low signal intensity and a small well delineated cyst of very high signal intensity on T2 favours the endometrial polyp.

Endometrial hyperplasia refers to diffuse endometrial thickening due to estrogen stimulation caused by chronic anovulatory status internal or external estrogen influence tamoxifen therapy or obesity. On MRI diffuse widening of endometrium with the signal intensity of the hyperplastic endometrium appearing hypo to isointense related to normal endometrium. Small, high signal intensity cystically dilated glands may be seen within it. Following contrast administration, the endometrial hyperplasia enhances less than the adjacent myometrium.



Fig (5)(i) T2 trim sag

UTERUS is bulky in size and shows an altered signal intensity lesion in anterior myometrium measuring 2.5x 1.6 cm in dimensions. The lesion is appearing hypointense on both 11 and 22v images s/o- intramural fibriod. Endometrium is thickned measuring 2/3 A mm. Endo myometrial junction is maintained <u>s/o- endometrial hyportalsaia</u>

Fig(5)(ii) T2 tse tra

Vascular Abnormality includes arteriovenous malformation and venous malformation. AV malformation appear as focal uterine mass with serpiginous flow related signal void and prominent parametrial vessel. Venous malformation as T2 dilated hyper intense veins within homogeneous enhancement is due to thrombi and phleboliths .It can be congenital or acquired. AVM may be associated with chronic Venus congestion on imaging dilated veins and torsion pelvic and parametrical varices on CT and MRI.

Incidence of ca cervix is high in India as compare to ovarian and endometrium carcinoma. Peak age of incidence is between 30 to 50 years of age. Main risk of cervical carcinoma includes early age of first coitus, multiple sexual partners, HPV infection. Early detection has been made with PAP smear examination and wide spread screening.

90% of cervical carcinoma is squamous cell carcinoma , others are adenocarcinomas and sarcomas . Clinically patients present with vaginal bleeding and discharge. Patients with advance disease may complaint of pelvic pain and symptoms related to lower urinary tract. Cervical cancer develops through various stages of dysplasia of cervical epithelium. Breach of the basement membrane leads to invasive carcinoma Spread of cervical cancer occurs through direct extension into parametrium and pelvic lymph nodes. Direct invasion of uterus and upper vagina may also occur. Involvement of urinary bladder, rectum and pelvic side walls occurs late.

MRI is the best imaging modality that can accurately determine tumor location, size, depth of the stromal invasion, extension into lower uterine segment, parametrial invasion and lymph nodes metastasis. On T2W1 tumors are relatively hyperintense mass and easily distinguishable from low signal intensity stroma. On T1W1 these are isointense to normal cervix. On dynamic contrast – enhanced MRI, small masses enhance homogeneously and earlier than normal cervical stroma. Large tumors are frequently necrotic and may or may not enhance, often give heterogeneous enhancement or peripheral rim enhancement.

Hydrosalpinx occurs when an inflammatory process produces adhesions of the fimbriated end of the fallopian tube , trapping the intraluminal secretions and dilation of the ampullary and infundibular portions of the tube . Dilated fallopian tubes are depicted as tubular fluid filled structures that are folded upon themselves to form a C or S shape or, at times , a multilocular mass . The diagnosis of simple hydrosalpinx is typically made by sonography Multiplanar imaging can be helpful in confirming the tubular nature of an adnexal mass or demonstrating incomplete septations. Thus confirming it to originate from the fallopian tube . MR can help in demonstrating incomplete septations and separate normal ovary. It can also help in determining the aetiology of hydrosalpinx. If hydrosalpinx is due to endometriosis signal intensity characteristics of the tubal fluid are similar to those in endometriomas (high T1 and low T2 signals intensity). In a patient with adhesions, signal intensity of the dilated tube follows that of simple fluid (low T1 and high T2 signal intensities)

Tubo -ovarian Abscess is a result of ascending infection that spreads to involve the endometrium and fallopian tubes . The ovaries are relatively resistant to infection and are involved only in more severe cases. Bilateral adnexal involvement is the rule and abscess formation tends to occur with late or inadequate treatment. It is typically a unilocular or multilocular complex mass with irregular borders and thickened wall. Multiple internal septations may be present. Normal ovarian stroma with follicles is often identifiable as part of the conglomerate mass. Anechoic or hypoechoic areas represent collection of frank pus. If air is present within the mass a diagnosis of an abscess can be made confidently . Abscess on MR imaging appears as unilocular or multilocular cystic mass with a thicker wall. The abscess fluid is of very high signal intensity on T2 image and low intensity on T1 image. The abscess wall and adjacent inflammatory changes enhance intensely with gadolinium showing thickened irregularly enhancing wall and septations. Infiltration of pelvic fat surrounding the mass may be evident . In chronic cases multiple pelvic organs may be involved and inflammatory signs can be absent, making differentiation from malignancy difficult.

Prolonged estrogen stimulation is the main risk factor for endometrial cancer. An increased incidence of endometrial carcinoma is seen in women taking estrogen , such as for oral contraception or postmenopausal hormone replacement therapy . Other risk factors include multiparity, obesity, diabetes. The peak incidence of endometrial carcinoma is between the ages of 55 and 65 years. Most patients present with postmenopausal vaginal bleeding or discharge .However, it can also occur in premenopausal women. Up to 90% of the endometrial cancers are adenocarcinoma . The rest include adenoSquamous carcinoma, clear cell carcinoma and papillary serous carcinoma . Endometrial carcinoma typically arises from body of uterus. The early growth is exophytic into the endometrial cavity followed by progressive invasion of myometrium. This pattern causes uterine enlargement . Metastatic spread occurs through pelvic, para aortic and rarely inguinal lymph nodes . Peritoneal spread occurs through the tubes and results in peritoneal implants.

On imaging endometrial carcinoma presents as widening of endometrial mucosa (5mm or more )in postmenopausal women. In premenopausal women the upper limit of endometrial thickness is 15mm. The tumor enhances less than the adjacent myometrium. Irregularity of uterine outline and stranding of parametrium is suggestive of extra uterine spread .On imaging MRI is best for evaluation of endometrial carcinoma. It provides an excellent morphological display of uterus and adjacent structures. T2W and gadolinium enhanced T1W axial and sagittal images are mostly used . Endometrial cancer appears isointense on T1W and hyperintense on T2W images when compared with myometrium. Presence of normal hypointense junctional zone seen on T2W images excludes myometrial invasion . Obliteration of junctional zone or irregularity of endometrium myometrium interphase suggests myometrial invasion.

Benign cystic adnexal masses include follicular cysts, corpus luteum cysts , theca lutein cysts and hemorrhagic ovarian cysts . Others are simple ovarian cysts, polycystic ovarian disease , hydrosalpinx , cystadenoma, paraovarion cysts , peritoneal inclusion cysts and endometriomas.

Simple ovarian cyst varies from 3 to 5 cm. On MR they are wellcircumscribed, homogeneous intermediate to low signal intensity masses on T1-weighted and very high signal intensity on T2-weighted image and enhances following gadolinium administration . Simple follicular cyst resolve spontaneously. Follow up ultra sound is recommended . 6 weeks after initial imaging evaluation to see for cysts resolution. The differential diagnosis of follicular cysts include surface epithelial inclusion cysts and para ovarian or para tubal cysts. A diagnosis of para ovarian cyst can be made when the ipsilateral ovary is seen close to but separate from the cyst. Simple ovarian cysts are common in premenopausal and postmenopausal women. Earlier 5 cm cyst was considered upper limit of removal. Now 10 cm is considered for follow up.

Corpus luteum cyst formed after ovulation by dominant follicle which becomes vascularized, thickened and partially collapsed . Corpus luteum cysts are unilateral and prone to hemorrhage and rupture . Corpus luteum cyst continues as corpus luteum of pregnancy after fertilization of ovum.

In 12-16 weeks cyst usually resolves spontaneously. The inner wall of the cyst wall may be seen as a line of high signal intensity on T1 weighted images and a line of low signal intensity on T2 weighted images representing hemosiderin deposited along its wall. Internal debris and hemorrhage can present within the corpus luteum but lack of internal enhancement rules out the possibility of ovarian malignancy. The most common complication of a functional cyst is hemorrhage. Hemorrhage can occur in any ovarian cyst but commonly seen corpus luteal cysts. Most frequently hemorrhagic cysts demonstrate high signal intensity on T1 and T2 images due to intracellular methemoglobin in the late subacute phase.

Polycystic ovarian disease is a complex endocrinological disorder resulting from chronic anovulation clinically characterized by amenorrhea or oligomenorrhea, infertility, hirsutism and obesity. In general the polycystic ovary contains twice the number of antral follicles which are usually less than 4mm in diameter and have twice the volume of the normal ovary. The cysts show uniform high signal on T2W Images. Hypertrophied ovarian stroma is depicted as broad central areas of low T1 and T2 signal intensity.

Endometriosis is defined as the presence of functioning endometrium located outside the uterus. The sites of implantation of ectopic endometrium in decreasing order of frequency are ovary, uterosacral ligaments, cul-de-sac, posterior wall of lower uterine segment, fallopian tube, rectovaginal septum and sigmoid colon. Ectopic endometrium may be diffuse or focal, more commonly being diffuse with minute endometrial implants involving pelvic viscera and their ligamentous attachment. It is a disease of women in the reproductive age group who may present with chronic lower abdominal pain, pelvic and back pain, dysmenorrhea, irregular bleeding and infertility.+



 Fig (6)(i) T2 me2d cor
 Fig(6)(ii) T2 tse sag
 Fig(6)(iii) T1 tse sag fat sat

 Reveals: a well defined cystic lesion seen in the right adenexal images. The lesions are mildly hypointense on T2W images i/o shadowing The lesion measuring 75:6.5 3 cm in dimensions, s/o likely regresenting small endometitionas. There is a vell defined cystic lesion shadowing The lesion measures 75:6.3 cm in dimensions, s/o likely regresenting small endometitionas. There is a vell defined cystic lesion showing heterogeneously hyperintense signal on both T1W and T2W images in the right adenexal region. No suppression of the signal intensity is seen on fat saturated images. The lesion measures 11.7x 7.8 cm. No evidence of solid component is seen SUGGESTITVE OF HEMORRHAGIC CYST\_Mill free fluid is seen in POD.

Endometriomas are internal hemorrhages within an area of endometriosis resulting in endometrial cysts. Most of pelvic endometriosis in found in the ovary. They are bilateral in 30-50% of cases and are frequently multilocular. Endometrioma on ultrasound is a cystic mass with homogeneous low level echoes. Repeated episodes of bleeding and rebleeding may result in development of irregular wall and echogenic mural nodules. Fluid level or fluid debris levels represent blood products.

MR improves diagnostic accuracy with endometrial cyst typically appearing as high signal intensity on T1-weighted sequence with shading or low signal intensity onT2 weighted sequence due to presence of blood product. "Shading sign" is a distinguishing feature of an endometrotic cyst at MR imaging which consists of T2 shortening in an adnexal cyst that is hyperintense on T1W images. It is most commonly manifested as a complete loss of signal intensity or dependent layering with a hypointense fluid level in an endometrioma.

Endometriotic cysts are highly viscus and have high concentration of protein and iron from recurrent haemorhage. The high iron and protein within the lesion leads to T2 shortening and contribute to signal intensity loss described as 'shading' The wall of an endometrioima is thick and can contain foci of low signal intensity on T1 and T2 weighted images due to combination of fibrosis and hemosiderin-laden macrophages. On contrast enhanced T1-Weighted images endometriomas show early wall enhancement.

Peritoneal inclusion cysts are result of active ovaries , pelvic adhesion and impaired absorption of peritoneal fluid. They occurs in premenopausal women. Pelvic inclusion cysts range from a few millimetres to large cystic lesions. It can present as pelvic pain, abdominal bloating . At imaging it presents as unilocular cystic adnexal masses that conform to the shape of the peritoneal cavity , Most peritoneal inclusion cysts contain hyperintense signal on T2 images, hypointense signal on T1 images. Occasionally internal hemorrhage can cause high signal on T1 images . There can be thin internal septations . Inclusion cysts may reoccur after surgery or drainage .





Multiple soft tissue component seen within the cystic lesion appearing hypointense on t2w and hyperintense on t3w images. The lesion measures:7.5.3.1 cms in dimensions left ovary is not seperarty visualized -imaging features are s/ ovarian cyst likely neoplastic etiology. histopathological correlation is suggested

Fig(8)(i) T2 tse sag Fig(8) (ii) T2 me2d cor Multiloculated large fluid collection seen in the pelvis with multiple internal septations appearing hypointense on t1 and hyperintense on T2w images - the collection is measuring 142 x 9.5 cm - <u>imaging</u> features are s/o-likely representing pelvic inflammatory disease

Cyst adenomas Cyst adenomas are benign epithelial tumours arising from the surface epithelium of the ovary. They are of two types serous and mucinous .\_Serous cyst adenoma presentS in four to fifth decades. There are Large, thin walled, unilocular cystic massesb with a mean size of around 10 cm. They may be multilocular in which the Septations are thin . Papillary projections may also be seen . Usually the cysts contain simple fluid with low signal intensity on T1 and high signal intensity on T2 weighted images. Rarely the cyst contents may be high protein or hemorrhagic.

Mucinous cyst adenomas occur in the  $3^{\mbox{\tiny rd}}$  to  $5^{\mbox{\tiny th}}$  decades. Mucinous cystadenoma are large (15-30cm) having multilocular appearance, with thin septae and low level mucoid material seen in the dependent portions of the mass .On MR imaging the thick mucinous content of the cyst may result in a high signal on T1 and low signal on T2 weighted images.





#### Fig(9)(i) T2 tse sagg

Fig(9)(ii) T2 me2d cor

cystic lesion is hyperintense on T2W, hypointense on T1W with a small soft tissue component which appears as hypointense on T2/STIR complex ovarian cyst.

In ovarian carcinoma majority are epithelial tumors . Others include germ cell tumors , stromal sex cord tumors and metastatic cancer from extraovarian primary sites.. Epithelial tumors are further classified into serous cystadenoma carcinoma, endometroid carcinoma, clear cell carcinoma , undifferentiated tumor. Patients present with abdominal pain, distention or symptoms related to gastrointestinal tract or and genitourinary tract compression or nonspecific constitutional symptoms.

Size more than 4cm large wall or septal thickness of more than 3mm, solid component or nodularity and presence of necrosis are the signs of ovarian carcinoma . Ancillary features supporting the diagnosis of malignancy include invasion of other pelvic structure, peritoneal deposits, ascites and lymphadenopathy. These features have accuracy of 91% in characterization of malignant ovarian tumors. Necrosis in a solid mass and vegetation in cystic masses are most reliable predictors of malignancy on MR imaging of adnexal masses. MRI is also accurate in demonstration of direct involvement of other pelvic structures by the ovarian tumors V.

Other typical features of ovarian cancer are a multi loculated lesion with thick [>3mm) ,some times irregular enhancing septation ,enhancing solid non fibrous components and papillary excrescences, cystic components within the tumor may contain serous hemorrhagic or mucinous fluid which is best characterized on T2 weighted images. Rarely ovarian cancer are predominantly solid lesions or solid masses with necrosis.

Germ cell tumor is the second most common group of ovarian neoplasm . It includes tumors mature teratoma , dysgerminoma , endodermal sinus tumors and choriocarcinoma. Mature teratoma is the only benign tumors of this group and they are the most common in this group. These tumors consists of mature tissue from two or more embryonic germ cell layers .On MRI, mature teratomas show variable findings from cystic to complex solid cystic mass consist of all the three germ cell layers or it may be noncystic mass containing fat . On MRI, these tumors are high signal intensity on T1W1 due to high fat content, signal intensity on T2W1 is variable. on STIR it is hypo intense or mixed signal intensity immature teratoma predominantly consists of solid mass with internal hemorrhage or necrosis.

Sex cord-stromal tumors consist of approximately 8% of ovarian neoplasm. Most common types are granulosa cell tumors, fibro thecoma and Sertoli- Leydig tumours.

Granuloma cell tumors are the malignant estrogen producing tumors. Fibroma and thecoma are the benign tumours. Fibroma and thecoma are the benign tumors seen in both pre and post menopausal women. There are solid mass mimicking malignant mass .These tumors consist of collagen and show low signal intensity on T1W1 and very low signal intensity on T2WI. Scattered area of high signal intensity may be seen due to edema or cystic degeneration. It may contain specks of calcification. Sertoli leydig cell tumors occur in young women and they are of low grade malignancy. On MRI, these tumours are well defined enhancing solid mass.

In our study further congenital anamolies are included . Vagina is of dual embryological origin with the mullerian ducts forming the upper two third and the distal vagina and vulva deriving from the urogenital sinus. MRI is the modality of choice to asses suspected developmental disorder of the vagina that may be isolated or associated with uterine abnormalities . Mullerian agenesis and hypoplasia account for approximately 10% of mullerian malformation and are characterized by segmental vaginal agenesis and variable degrees of uterine hypoplasia.

Other congenital anamolies are unicornuate uterus, uterus didelphys with longitudinal vaginal septum , bicornuate uterus, septate uterus with incomplete resorption of the medial septum , arcuate uterus and a small uterus with a small T shaped endometrial cavity. These congenital anamolies can be well detected on MRI.

### CONCLUSION

.MRI is an excellent investigation to evaluate the female pelvic masses due to its high spatial resolution, excellent tissue contrast, and multiplanar imaging capability. It is a very good modality for the tumor staging and follow-up of the cases. Certain key imaging features of uterine or adnexal pathologies on MRI are helpful in the specific diagnosis or narrow down the differential diagnosis. Characterization of uterine and ovarian tumors helps in the surgical planning.

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