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Utility of sagittal T2 weighted magnetic resonance imaging in detection of uterine and adnexal lesions- as screening modality in general population

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Abstract
This study is aimed at formulating a limited magnetic resonance imaging (MRI) examination protocol for detection and stratification of various female pelvic lesions in a rapid and cost effective manner. Retrospective study was done with 70 female patients, where accuracy of sagittal T2 weighted imaging in characterizing the lesion was compared with complete MRI of pelvis. In 60% of cases (42 out of 70) accurate detection, localization, extent and characterization of lesions were possible with sagittal T2WI sequence alone, without the help of complete MRI pelvis. In remaining 40% cases, organ of origin and extent lesion could be detected on sagittal T2WI. However, complete MRI pelvis with contrast was needed for characterization and diagnosis of the lesion. Our study concluded that sagittal T2W sequence is an easy, rapid and cost-effective method of screening of female pelvic lesions for determining organ of origin, region of organ involved and is extremely useful in lesion detection in low socioeconomic patients in developing countries who cannot afford dedicated MRI pelvis

Keywords: MRI, screening, female pelvic lesions, T2WI, uterus, adnexa

Introduction

In the women of reproductive and post-menopausal age group, uterine and adnexal lesions are common cause of morbidity. Benign lesions are common in reproductive age group and malignant tend to occur in post-menopausal women. A large group of pelvic lesions leads to diagnostic dilemma because of their close proximation to other pelvic structures. In suspected cases of pelvic pathology, ultrasonography (USG) is the first line of investigation. However, there is a limitation to USG due to poor acoustic window and inadequate depth penetration leading to difficulties in assessment of the pelvic lesions. As ultrasound examination is inadequate, Magnetic Resonance Imaging (MRI) is extremely useful as it has better anatomic delineation, contrast resolution and accurate tissue characterization of the lesion. MRI is more accurate and specific than USG for characterizing adnexal lesions. But, it is cost intensive and time taking [1]. With a systematic approach to complex pelvic masses diagnosed on USG, with appropriate clinical history of the patient and imaging characteristics on MRI often radiologists can arrive at a differential diagnosis and sometimes a definitive diagnosis [2]. The existing MRI protocol for female pelvis is taking T1-weighted image (T1WI) in axial and coronal planes. T2-weighted image (T2WI) in axial, coronal and sagittal plane. T2-gradient-echo (GRE) sequences in the axial plane. Short tau inversion recovery (STIR) sequence in axial, coronal and sagittal planes. Diffusion restriction imaging (DWI) in axial plane. Post contrast T1 fat saturated (T1FS) sequence in axial, coronal and sagittal planes. Limited MRI examination protocol followed in this study involved T2WI sequence in the sagittal plane. In private diagnostic centers, charges for ultrasound of pelvis are approx. Rs.1000-1200 / and for complete MRI examination of pelvis approx. Rs. 7000-9000/-. The charges for screening of MRI pelvis with sagittal T2WI are approx. Rs.2000-2500 /. Time taken for complete MR examination of pelvis and limited examination (sagittal T2WI) is approximately 25-30 minutes and 1 minute 58 seconds respectively. Due to reduced cost of the examination, lesser time taken for the MR examination and easy diagnosis of complex lesions, objective of this study was to formulate and evaluate a limited MRI examination protocol for screening female uterine and adnexal lesions, which can be performed rapidly and will be inexpensive, especially in the low socio economic group.

2. Materials and methods

A total of 70 patients were studied retrospectively whose MRI pelvis was done on 1.5 T Siemens Avanto in the Department of Radiology, Dr. D.Y. Patil Medical College from September 2018 to December 2019. Initially all imaging sequences were studied followed by analysis of pathologies in sagittal T2WI sequence was done. Comparison of limited MRI examination protocol and detailed MRI examination of pelvis was done with respect to accuracy in detection of the lesions, cost and time taken for the scan. All patients who underwent MRI had USG reports for

comparison. Post-operative, post-radiotherapy and post-chemotherapy patients were excluded from this study. Complete MRI examination in axial, coronal and sagittal planes using T1W, T2W, GRE-T2, short tau inversion-recovery (STIR) and Diffusion weight (DWI) sequences was done. The total time taken for complete MRI scan varied between 25 to 30 min. Sagittal T2WI was labeled as the limited examination protocol. Pulse sequence parameters were repetition time (TR)-4290ms, echo time (TE)-84 ms, time of acquisition 1.58 min, field of view (FOV) 300 mm, slice thickness 4 mm, interslice gap 10% (0.4 mm), flip angle 180, matrix 320 × 288. A total of 25-30 images were obtained in 1 min 58 s. Body coil was used for radiofrequency transmission and reception.

3. Results

Age group distribution of the patients varied from 11 to 70 years in which maximum cases belonged to age group 31-40 (38.5%), followed by 41-50 (28.5%) and 41-50 (22.2%) (Table 1)

Table 1: Age group distribution of lesions

Age Group (years)	No of patients (%)
0-10	00 (0%)
11-20	05 (7.2%)
21-30	08 (11.4%)
31-40	27(38.5%)
41-50	20 (28.5%)
51-60	5 (7.2%)
61-70	5 (7.2%)
>71	00 (0%)

Retrospective study was done in 70 cases, organ of origin was easily identified by Sagittal T2WI in all the cases (100%), in which 31(44.2%) were adnexal lesions, 28(40%) were uterine body and 11(15.7%) were cervical lesions. (Table 2) In 42/70 (60%) cases, accurate localization, extent and characterization of lesions was possible with sagittal T2WI sequence. Most of these were uterine, of which 27 were in body of uterus and 10 in cervix and 5 were adnexal lesions. Uterine lesions included 22 fibroids (12 intramural, 8subserosal, 2 submucosal), 5 adenomyosis (2 adenomyomas).

Few large subserosal fibroids showed bridging vessel sign.

Of 10 cervical lesions, one was fibroid and 9 cases were carcinoma cervix where carcinoma cervix cases appeared hyperintense on T2WI.

Adnexal lesions (5) including 2 simple ovarian cysts, 1para ovarian cyst, 2 hydrosalpinx where diagnosis is possible with sagittal T2WI without the help of complete MRI pelvis.

Table 2: Organ of origin and lesions

Organ of origin	Lesions	No of patients	
Body of Uterus	Fibroids	22 (31.4%)	28 (40%)
	Adenomyosis	5 (7.14%)	
	Carcinoma	1 (1.4%)	
Cervix	Fibroid	1 (1.4%)	11 (15.7%)
	Carcinoma	10 (14.2%)	
Adnexa	Endometrioma	6 (8.57%)	31(44.2%)
	Serous cystadenoma	4 (5.71%)	
	Tubo ovarian abscess	3 (4.28%)	
	Haemorrhagic cyst	2 (2.85%)	
	Mucinous cystadenoma	2 (2.85%)	
	Simple ovarian cyst	2 (2.85%)	
	Hydrosalpinx	2 (2.85%)	
	Mature teratoma	2 (2.85%)	
	Para ovarian cyst	1 (1.4%)	
	Fibrothecoma	1 (1.4%)	
	Ovarian torsion	1 (1.4%)	
	Carcinoma	5 (7.14%)	

In remaining 28/70(40%) cases, organ of origin and extent of lesion could be detected on sagittal T2WI. However, complete MRI pelvis with contrast was needed for characterization of the lesions. These included 6 endometriomas which were showing T2 shading and 2 hemorrhagic cysts which showed variable appearance on T2WI (hypointense to hyperintense signals), which could be accurately diagnosed with additional GRE and T1W sequence. Rest of cases including 4 serous cystadenoma, 2 mucinous cystadenoma, 2 mature teratomas, 3 tubo- ovarian masses, 1 ovarian torsion, 1fibrothecoma, 1 carcinoma cervix (appearing hypointense on T1WI), 1 carcinoma endometrium and 5 carcinoma ovary needed complete MRI pelvis with contrast for characterizing the lesion. Comparison of our findings was done with a detailed MRI examination of pelvis. Complete MRI examination of the pelvis showed additional findings about better anatomical localization due to multiplanar imaging, pattern of contrast enhancement and diffusion restriction. Lesions showing T2 shading were better evaluated with detailed MRI examination

when compared with limited MRI protocol. However, in view of advantages of limited pelvis MR examination protocol (low technical requirements with easy availability of body coil, reduced time taken and low cost), it can be implemented in screening of pelvic lesions, especially in developing countries in low socioeconomic population, who may not be able to afford detailed MRI examination.

4. Discussion

MRI is frequently used for detection and characterization of large female pelvic lesions. Most of these lesions include uterine, cervical and adnexal lesions. Of these commonly encountered are uterine fibroids, ovarian cystic lesions, cervical carcinoma and ovarian carcinoma. Thus, establishing a differential diagnosis is extensive. However with the help of MRI (for localization of lesion and tissue characterization) and appropriate clinical history of patient, we can arrive at a narrowed differential diagnosis [3]. In our study maximum of lesions were uterine fibroids, carcinoma cervix, endometrial cysts and adenomyosis.

Differential diagnosis based on image characteristics on T2WI includes the following:

T2 hyperintense: (Simple fluid, Lipid, Blood) – Functional ovarian cyst, cystic neoplasm, hydrosalpinx, hemorrhagic cyst, endometriotic cyst, teratomas, and lipoleiomyoma.

T2 Hypointense: (Fibrous tissue, smooth muscle) – Leiomyoma, Fibroma, Fibrothecoma, Brenner tumor, cervical and endometrial carcinoma [2].

4.1 Fibroids/Leiomyomas

These are benign tumors consisting of smooth muscle [4]. Fibroids constitute most common solid benign neoplastic lesions of pelvis with a prevalence of approx. 77%. Four to five women of reproductive age complains of symptoms which includes [5, 6] - pelvic pressure or pain (due to mass effect), heavy bleeding and reproductive dysfunction [3]. Myomas (Figure 1) are well-defined round to oval focal lesions with sharp margins appearing homogeneously hypointense on T2WI in comparison with rest of myometrium [7]. Some Fibroids show a hyperintense rim on T2WI constituted by pseudocapsule (veins, dilated lymphatics, edema or a combination of all). Fibroids can be sub mucosal, intramural and subserosal in location and few subserosal fibroids are large and pedunculated which may be easily confused with adnexal mass lesions. However, the utility of bridging vessel sign (Figure 2) is helpful in such cases as its presence indicative of uterine of the lesion/mass in question. Most common location of fibroids is intramural, subserosal being next common and submucosal is least common. In our study maximum numbers constituted by intramural fibroids than subserosal and submucosal. Leiomyoma's may undergo degeneration with changes in hemodynamics occurring in conditions like - rapid growth (pregnancy), menopausal atrophy, or trauma. These degenerated leiomyoma's typically shows high signal intensity on T2WI in comparison with non-degenerated regions [8]. Fibroids with degeneration are also well circumscribed and T2 signal characteristics of various types of degenerations include the following: a) Hyaline degeneration – Most common type homogeneously hypointense to normal myometrium [9].b) Cystic degeneration – cystic spaces show increased signal intensity while rest of the lesion is hypointense [8]. c) Myxoid degeneration – heterogeneous and markedly increased signal intensity. d) Red or Carneous degeneration - show a peripheral rim of decreased signal intensity on T2WI which is constituted by dilated, thrombosed vessels containing intracellular methemoglobin. With time, ring like calcification occurs appearing as signal void along the margin of leiomyoma [10]. e) Calcific degeneration – seen in hyaline degeneration (dystrophic, amorphous and infracted hyaline fibroid), auto infraction, post UAE cases – produced signal void in all sequences. While leiomyosarcomas show ill-defined, irregular infiltrating margins, usually solitary, heterogeneous T2 signal with areas of cystic necrosis within [11].

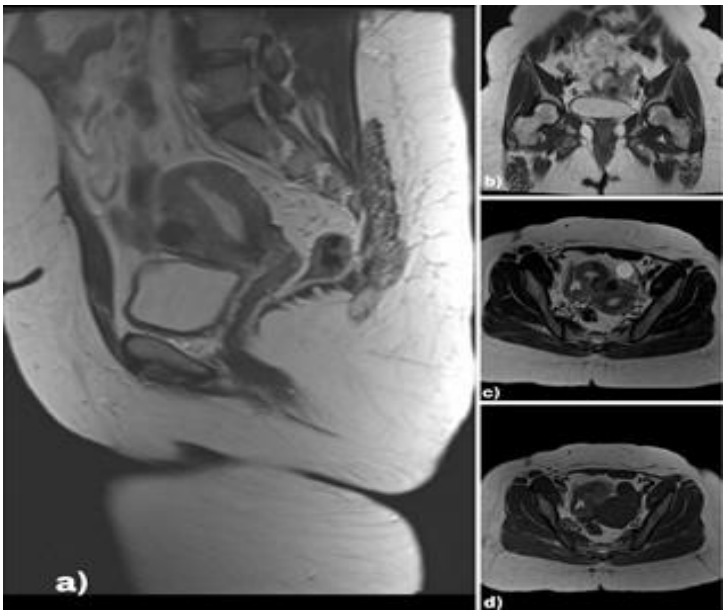

Fig 1: Uterine intramural leiomyoma showing serosal extension; a) Sagittal T2WI showing a well-defined hypointense lesion in the anterior wall myometrium of uterus; b) and c) coronal and axial T2WI respectively, confirming anterior wall intramural fibroid. d) Leiomyoma appears isointense to uterine myometrium on axial T1WI.

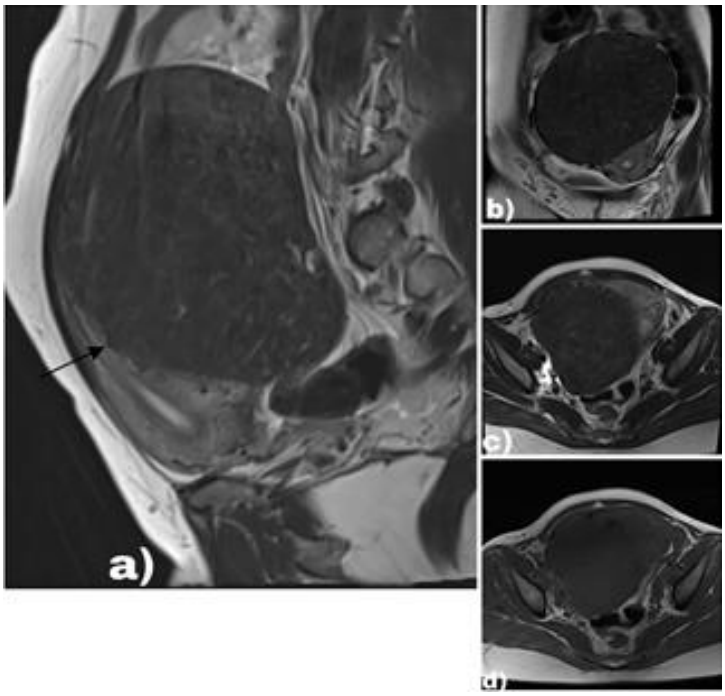

Fig 2: A large sub serosal uterine leiomyoma; a) Sagittal T2WI showing a well-defined large solid lesion arising from right posterior- superior uterine wall of fundus and body region showing bridging vessel sign (arrow), This lesion is appearing heterogeneously hypointense with hyperintense areas within (cystic degeneration). b) and c) coronal and axial T2WI respectively, confirming the location and showing the extent of subserosal fibroid. d) Leiomyoma appears isointense to uterine myometrium on axial T1WI

4.2 Adenomyosis

It is one of the commonest non-neoplastic diseases characterized by ectopic endometrium in the myometrium. Typical adenomyosis (Figure 3) is characterized by a bulky uterus showing ill-defined hypointense areas (glandular endometrium) within the myometrium on T2WI with multiple hyperintense tiny cysts within. In addition to this there will be thickened junctional zone and loss of endometrial myometrial differentiation.

Adenomyoma

Localized form of adenomyosis is called adenomyoma seen as an intramyometrial mass (Figure 4) or intracavitary or subserosal polypoid mass. Adenomyoma appears similar to adenomyosis but more heterogeneous on T2WI and may mimic uterine sarcomas in some cases [12].

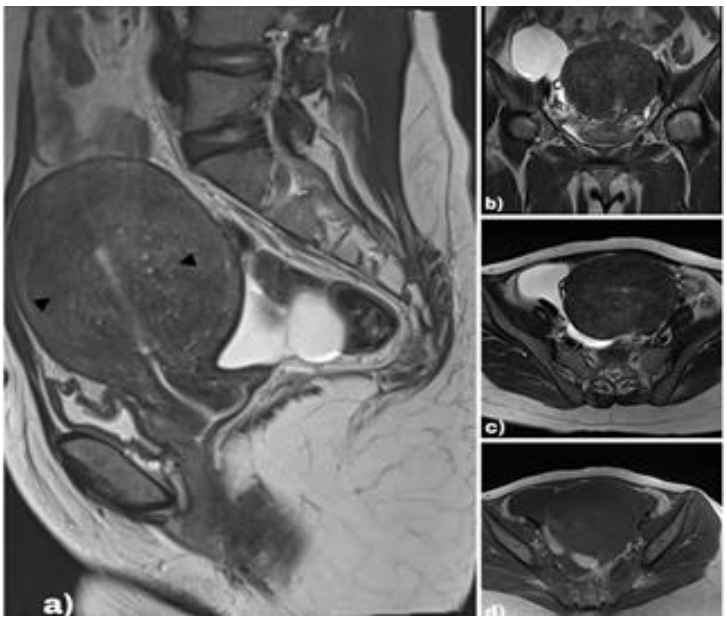

Fig 3: Adenomyosis; a) Sagittal T2WI shows a bulky uterus appearing heterogeneous with multiple cystic areas in the myometrium, thickened junctional zone (arrowheads); b) and c) coronal and axial T2WI respectively, showing adenomyosis. d) On axial T1WI lesion appears isointense to uterine myometrium.

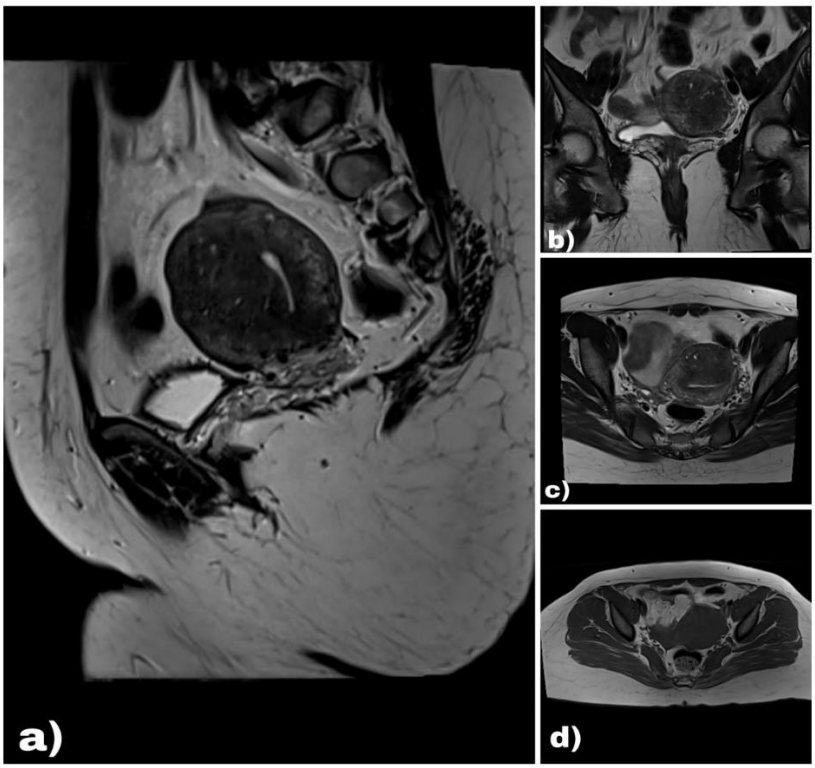

Fig 4: Adenomyoma a) Sagittal T2WI showing an ill-defined focal hypointense lesion with few hyperintense cysts within in the anterior wall uterine myometrium with thickened junctional zone. b) and c) are coronal and axial T2WI respectively, confirming the location of adenomyoma. d) On axial T1WI lesion appears isointense to uterine myometrium.

4.3 Endometrial carcinoma

It is the commonest malignancy in females in western part of the word but its incidence is comparatively less in India [13]. In our study, 1 case of endometrial carcinoma was detected. MRI is extremely useful for detection, staging and post treatment monitoring of endometrial carcinoma. On MRI endometrial carcinoma (Figure 5) appears isointense to hypointense T1WI and isointense on T2WI but hypointense to normal endometrium. Endometrial carcinoma shows contrast uptake but enhancement is less in comparison to normal myometrium. T2WI can better detect myometrial invasion. Depth of invasion can be assessed even better with dynamic contrast study [14].

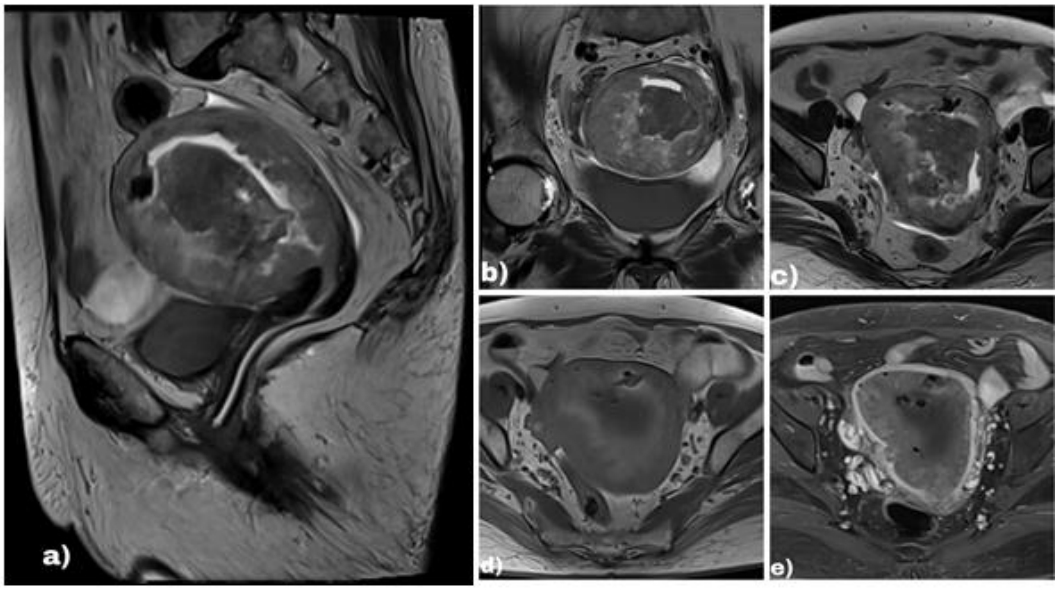

Fig 5: Endometrial carcinoma, a) Sagittal T2WI showing an ill-defined lesion in central part of body and fundus, appearing hypointense in center and hyperintense in the periphery; b) and c) are coronal and axial T2WI respectively confirming the location and showing extent of lesion; d) Axial T1WI showing ill-defined lesion with central hypointensity and peripheral hyperintensity; e) Axial T1FS post-contrast image showing subtle contrast enhancement of the lesion but less enhanced in comparison to normal myometrium.

4.4 Carcinoma cervix: Most frequent in 4th to 5th decade of life. Squamous cell carcinoma is commoner than adenocarcinoma. Depending on the size of the lesion, clinical manifestations vary. Vaginal bleeding is most important clinical feature [15]. T2WI can both identify the primary tumor and its extent. Cervical carcinoma (Figure 6) appears hyperintense to adjacent cervical stroma on T2WI and isointense on T1WI showing contrast enhancement. Staging of cervical carcinoma can be done in most of cases by acquiring additional axial and coronal planes [16].

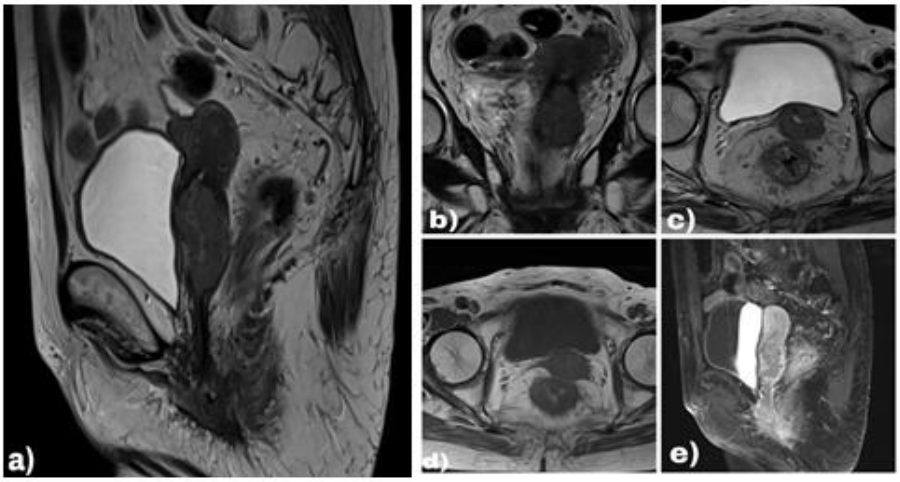

Fig 6: Carcinoma cervix. a) Sagittal T2WI is showing an ill-defined soft tissue lesion in the cervix appearing hyperintense; b) and c) are coronal and axial T2WI respectively, showing the extent of the lesion; d) On axial T1WI lesion appearing hypointense. e) Sagittal T1FS post contrast image showing heterogeneous contrast enhancement of the lesion.

4.5 Adnexal lesions

Foti PV *et al* classified adnexal lesions into four groups based on morphological appearance on MRI [17].

A. Unilocular cystic lesions: These are mostly benign and consist of both non-ovarian and ovarian lesions which usually appear hyperintense on T2WI, and these include;

1. **Paraovarain cyst:** Identification of ipsilateral ovary is essential in diagnosing paraovarian cyst and avoiding misinterpretation (Figure 7). However, few lesions may show beak sign.
2. **Hydrosalpinx**: It is term used for Fallopian tube which is dilated and fluid filled, in some cases hydrosalpinx may show cystic appearance which can be confused with an ovarian cyst. Hydrosalpinx appears as sausage shaped tubular structure which can be easily demonstrated by multiplanar imaging. However, its oblong shape and visualization of ovary separately rules out ovarian cyst.

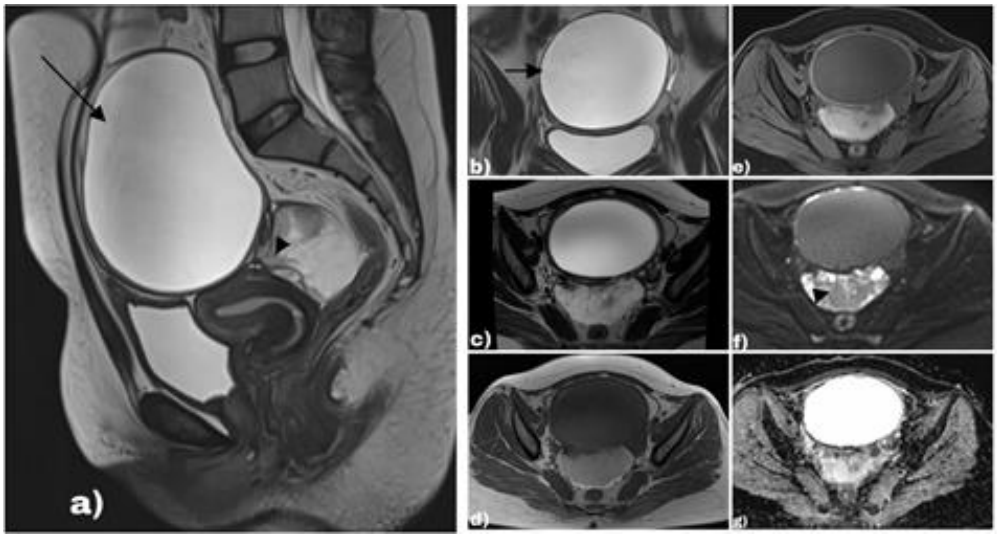

Fig 7: Para ovarian cyst in right adnexa and hemorrhagic infract with ovarian torsion on right side; a) Sagittal T2WI showing a large well-defined hyperintense lesion (arrow) postero-superior to uterus in the right adnexa. A large ovoid hyperintense solid lesion in the right adnexa (arrow head), is the bulky right ovary showing hemorrhagic infract [showing foci of diffusion restriction with low ADC values- f) b value images & g) ADC]; b) and c) are coronal and axial T2 weighted images respectively, confirming the location and extent of para ovarian cyst and torsion ovary. d) On axial T1 weighted image paraovarian cyst is appearing hypointense and ovarian torsion with hemorrhagic infract is appearing hyperintense. e) Both para ovarian cyst and ovarian torsion shows peripheral enhancement on axial T1FS post contrast image.

3. **Functional cysts:** These are common cystic lesions in women of 2nd to 4th decade. Functional cysts include – follicles (<20mm), dominant follicles (20-25mm) and follicular cysts (unruptured follicles >3cm).
4. **Serous cystadenoma** (Figure-8): It is a common benign cystic neoplasm presenting predominantly as a unilocular cystic lesion (can be multilocular also) with thin walls (<3 mm), mostly without any internal septations, solid component and papillary projections within, showing no significant contrast uptake. Serous fluid appears hypointense on T1WI and hyperintense on T2WI. Small papillary projections indicative of borderline malignancy.

Fig 8: Serous cystadenoma of left ovary; a) Sagittal T2WI showing a well-defined large lobulated hyperintense lesion with a single septa within, without any obvious papillary projections or solid components; b) and c) are coronal and axial T2WI confirming the location and extent of the lesion. d) On axial T1WI serous cystadenoma appears hypointense.

B. Multilocular cystic lesions: These lesions can be both benign and borderline including the following –Endometriotic cyst or endometrioma, mucinous cystadenoma.

1. **Endometriosis:** It is ectopic implantation of functional endometrial tissue outside of uterus. Its localized form affecting ovaries is characterized by "endometriotic cyst or chocolate cyst". These can be often bilateral appearing as cystic or complex masses appearing hyperintense on T1WI and isointense to hypointense on T2WI (Figure 9). On T1WI, these may be confused with some fat containing lesions like dermoid cyst. Fat saturated T1 sequences are useful to rule out a fat content. On T2WI a specific sign known as "shading sign" is observed which is evident from the repeated bleeding in the cyst.

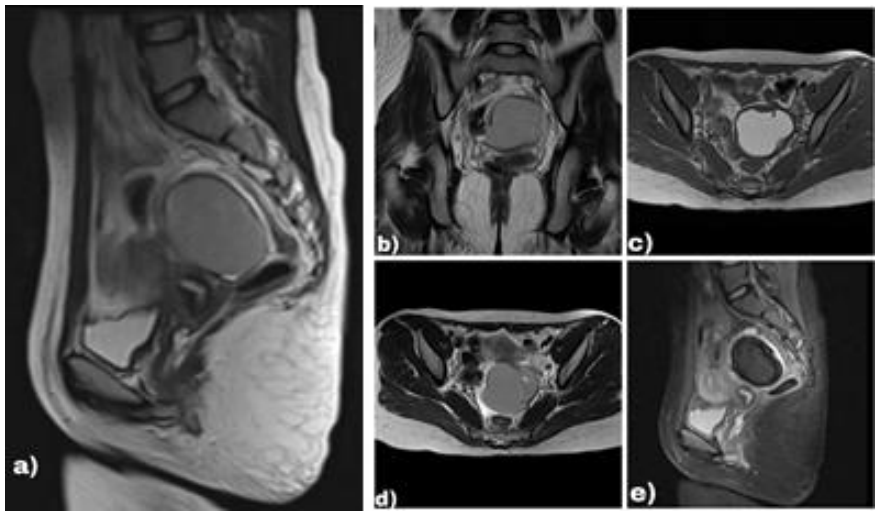

Fig 9: Endometrioma of left ovary; a) Sagittal T2WI showing a well-defined hypointense lesion (T2 shading sign) in left adnexa and left ovary is not seen separately. b) and c) are coronal and axial T2WI respectively, confirming the location and extent of the lesion. d) On axial T1WI endometrioma is appearing hyperintense; e) Sagittal STIR image showing endometrioma appearing hypointense.

2. **Mucinous cystadenoma:** It is a benign cystic neoplasm containing mucin. It is larger in size when compared to serous cystadenoma and predominantly unilateral. Unlike serous cystadenoma, it is a multiloculated lesion with thin walls and multiple internal septae. However there is no solid component and does not show significant post contrast enhancement. These cystic loculi have mucin of varying concentrations within which may appear heterogeneous on both T1WI and T2WI which can be termed as - stained glass appearance (Figure 10).
3. **Borderline tumors:** Histologically these tumors are characterized by epithelial anaplasia. In contrast to malignant ovarian neoplasms, borderline neoplasms are common in younger age group. Most of the borderline tumors are constituted by mucinous and serous cystadenomas. Serous cystadenomas can be termed as borderline when they appear as complex cystic lesions showing papillary projections and septae within.

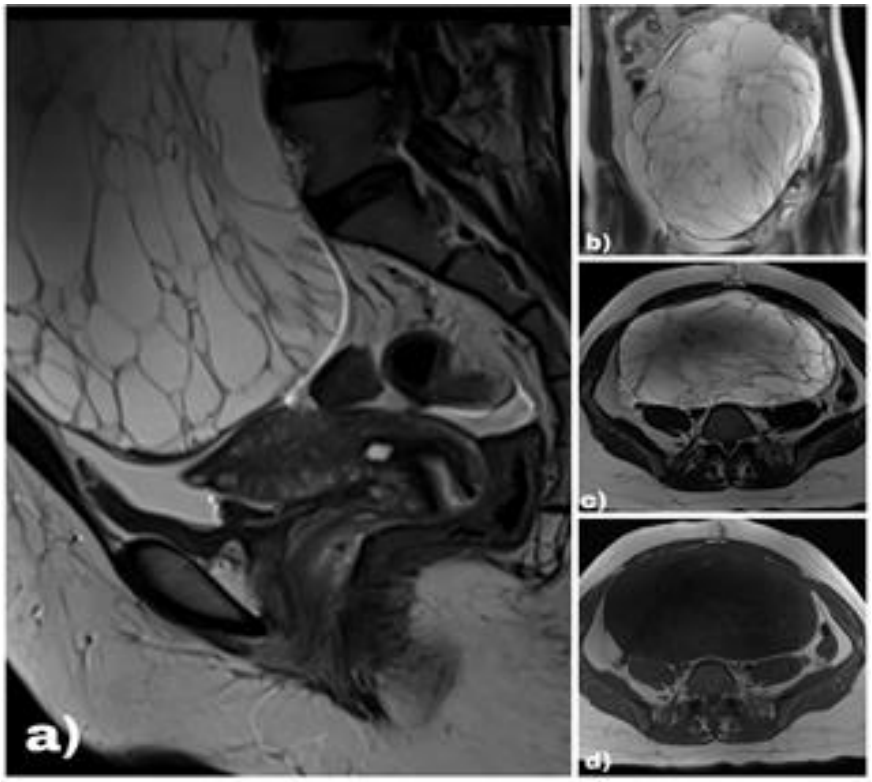

Fig 10: Mucinous cystadenoma of left ovary; a) Sagittal T2WI of a large well-defined multiloculated cystic lesion in left adnexa appearing hyperintense with multiple hypointense septae. b) and c) are coronal and axial T2WI respectively, confirming the location and extent of the lesion. d) On axial T1WI, mucinous cystadenoma appearing hypointense with isointense septae.

C. Solid – cystic masses: A mixed solid-cystic ovarian lesion may raise the suspicion of malignancy which can be surface epithelial tumor or metaplastic. Some benign lesions including dermoid cyst (mature cystic teratomas) also appears as a complex mass.

1. **Mature cystic teratoma:** It is one of the commonest ovarian neoplasms predominantly affecting younger age group. This lesion shows heterogeneous appearance owing to its contents which are skin, fat, bone, hair which are arising from all three germ layers. Presence of fat is important for diagnosis of teratoma which appears hyperintense on both T1 and T2WI with suppression on fat suppression sequence. Fat can be differentiated from hemorrhagic lesions like endometriotic cysts with the use of T1W- fat-saturated pulses. Features of mature cystic tertoma (Figure11) include – Rokitansky nodules, teeth and fat-fluid interface
2. **Struma ovarii:** It is an ovarian teratoma arising from a single germ layer mostly consisting of thyroid tissue. It appears as a complex solid- cystic mass on MRI with heterogeneous signal intensity. Cystic areas appear hypointense on T1WI and hyperintense on T2WI. However some cystic areas may appear hypointense on both T1 and T2WI owing to their colloid content. Struma ovarii can be differentiated from mature cystic teratoma by absence of fat within the lesion.

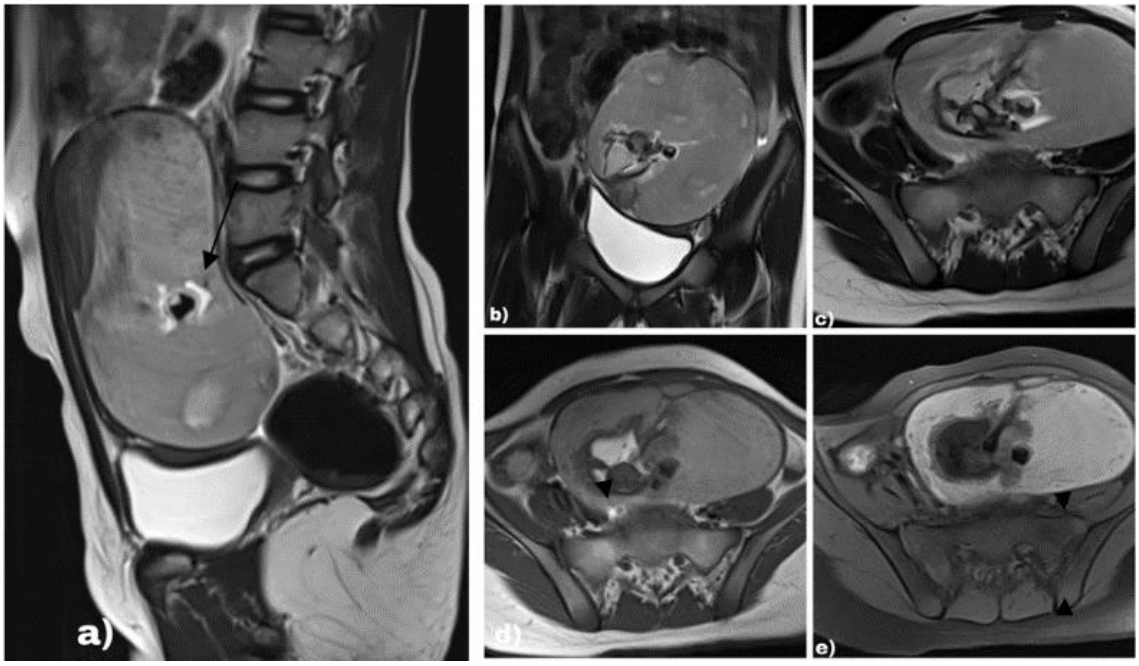

Fig 11: Left ovarian dermoid cyst / mature cystic teratoma showing fat (arrow head) and tooth (arrow); a) Sagittal T2WI showing a large well-defined hyperintense lesion with a central hypointense are likely tooth (arrow); b) and c) are coronal and axial T2WI respectively, confirming the location and extent of the teratoma. d) Axial T1WI show a large well-defined hyperintense lesion with central hyperintense area (arrow head) suppressed on fat suppression sequences (e).

3. **Surface epithelial stromal tumors:** Are most common of all ovarian malignancies. Solid cystic tumors of surface epithelial stromal tumors include the following:

a. **Serous cystadenocarcinoma:** This constitutes majority of the ovarian malignancies, mostly bilateral in comparison to mucinous cystadenocarcinoma.

b. **b) Mucinous cystadenocarcinoma** (Figure-12)**:** This is less common when compared to serous cystadenocarcinoma. Both serous and mucinous cystadenocarcinoma can be of variable sizes and as large as >12cm. These show features – multilocular lesions with thick irregular walls, internal septae, solid component and papillary projections appearing hypointense on T2WI with post-contrast enhancement. Cystic components appear hypointense to isointense on T1WI and hyperintense on T2WI.

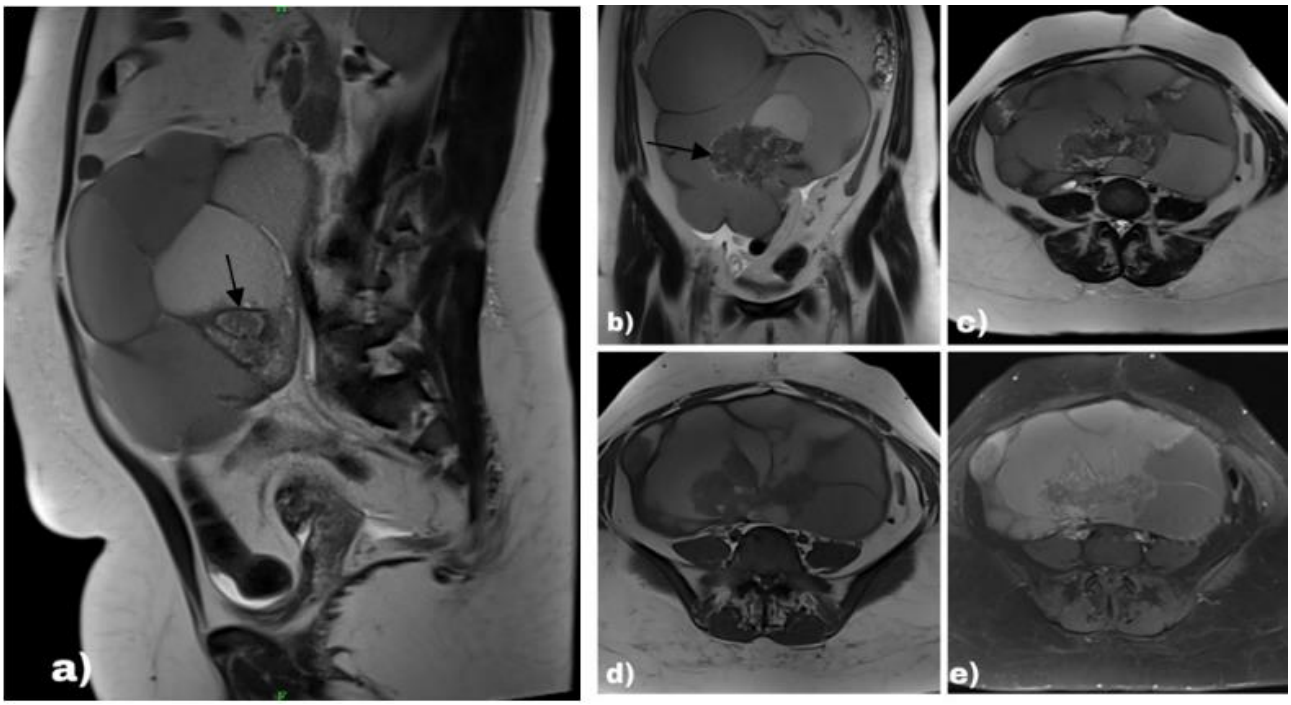

Fig 12: Mucinous cystadenocarcinoma of right ovary; a) Sagittal T2WI showing a well-defined large multiloculated lesion appearing heterogeneous (stained glass appearance) with multiple thick septae and a central solid component (Arrow); b) and c) are coronal and axial T2WI respectively confirming the location and extent of the lesion. d) On axial T1WI lesion appears heterogeneous with septae and solid component appearing hypointense. e) Axial T1 FS image showing enhancement of septae and solid component.

c. **Clear cell tumor:** This shows association with endometriosis and appears as a complex solid-cystic mass or may show cystic appearance also. Possibility of malignancy should be considered when an endometriotic cyst shows rapid growth, appearing multilocular with mural nodules within and showing post contrast enhancement.
d. **Yolk sac tumor:** It is a rare ovarian malignancy seen in 20-30 years age group. It is large tumor showing solid cystic areas within. It is a vascular tumor where enhancement of focal dilated vessels gives a bright dot sign.
e. **Granulosa cell tumor:** This can be either benign or malignant tumor, usually benign showing solid or cystic appearance.

D. Predominantly solid Lesions: These can be benign, borderline or malignant.

1. **Fibroma, thecoma and fibrothecoma:** These are most common benign solid lesions of ovaries come under sex cord stromal tumors. Fibromas appear hypointense on T2WI owing to its collagen content, while thecomas consists of lipid content. Fibrothecoma (Figure 13) consists of both fibrous and lipid content within appearing as well-defined solid lesions appearing hypointense to isointense on T1WI and hypointense on T2WI showing minimal post contrast enhancement. Cystic areas noted in the lesions suggestive of degeneration which may appear hyperintense on T2WI. Pedunculated subserosal fibroid can be differentiated by Fibrothecoma by visualization of ipsilateral normal ovary with the help of multiplanar images.

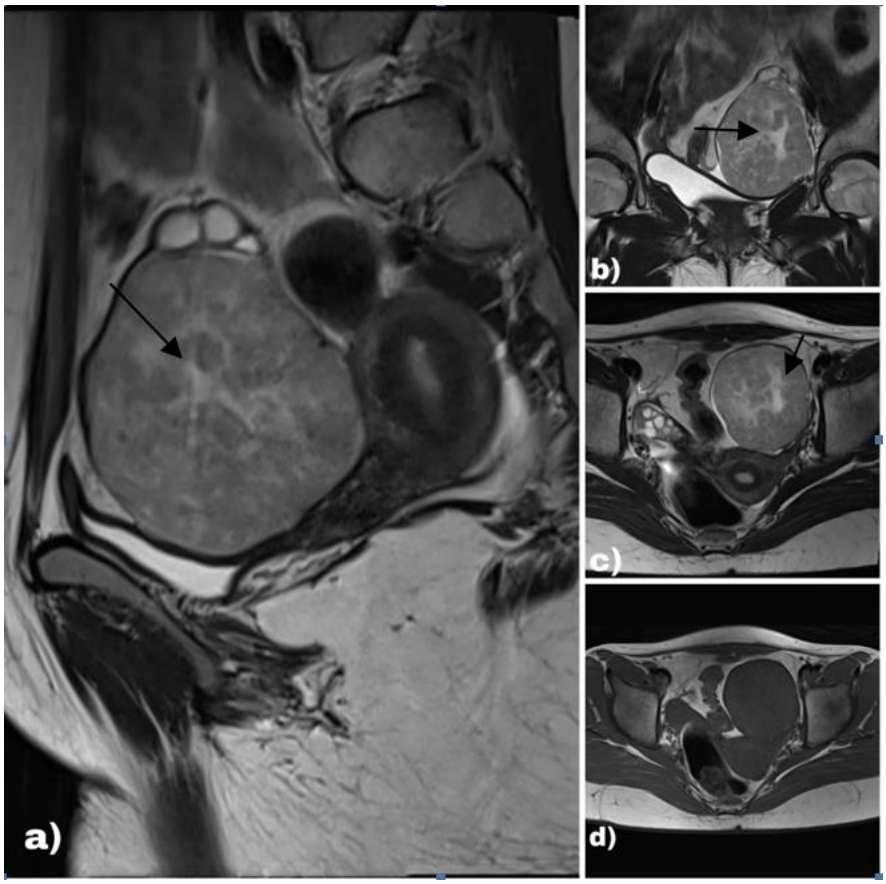

Fig 13: Fibrothecoma of left ovary; a) Sagittal T2WI showing a well-defined heterogeneously hyperintense solid lesion arising from the left ovary, central hyperintense areas (arrow) corresponds to degeneration. b) and c) are coronal and axial T2WI confirming the location and extent of the lesion. d) On T1WI fibrothecoma appearing isointense to muscle.

2. **Brenner tumor:** It is another rare ovarian tumor, mostly benign appearing hypointense on T2WI owing to its fibrous nature. Calcifications are better appreciated on CT and USG.
3. **Dysgerminoma:** It is a solid lesion with septae and surrounding fibrous capsule appearing isointense to hyperintense on T2WI and septae appear hypointense but showing significant post contrast enhancement.
4. **Sertoli-Leydig cell tumors:** Are rare ovarian tumors commonly associated with virilization. These are predominantly solid lesions and some may contain cystic areas. Solid lesions are appearing hyperintense on T2WI owing to its fibrous content while cystic areas appear hyperintense on T2WI.

5. Conclusions

Due to superior tissue contrast resolution, MRI is the best imaging modality for female pelvis. It gives accurate anatomic delineation and characterization of the pelvic lesion. In characterizing adnexal lesions, MRI is more specific and accurate than USG. However it is costly. In view of advantages of limited pelvis MR examination protocol (sagittal T2WI) with low technical requirement, easy availability of body coil, reduced time taken and low cost, it can be implemented in screening of pelvic lesions, especially in developing countries in low socioeconomic population, who may not be able to afford detailed MRI examination. From this study, we arrived at conclusion that limited MRI protocol is extremely useful in detection and characterization of uterine lesions rather than adnexal lesions, which need complete MRI examination. More extensive study is needed for formulation of this protocol.

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