

Spectrum of magnetic resonance imaging findings of endometriosis in Kashmiri women: A Descriptive study

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Abstract

Background: Endometriosis is a relatively common gynaecological condition affecting premenopausal women often associated with pelvic pain and infertility. It is pathologically characterised as the presence of ectopic endometrial glands and stroma outside the uterus. Because its effects may be life impacting, radiologists should be familiar with the various imaging manifestations of the disease, especially those that are relatively specific for the disease.

Aims and objectives : The aim of our study is to describe the various common patterns of MRI manifestations of pelvic endometriosis in premenopausal women from Kashmir.

Methodology : The current study is a cross sectional observational study conducted by reviewing already existing MRI images in the radiology department of SMHS hospital Srinagar from September 2021 to December 2022 . All the pelvic MRI studies of premenopausal females who had MRI features of endometriosis were included in the study. The MRI studies of these patients were re-evaluated and compiled by experienced radiologists with more than 8 years of experience in radiology. Exclusion criteria included a history of pelvic surgery for endometriosis or adnexal disease.

Results : We gathered the imaging data from 47 patients. Out of these 27 patients had ovarian endometriosis with its varied manifestations, endometriosis associated adhesions were seen in 16 patients, 14 patients had posterior cul de sac disease, anterior cul de sac involvement was seen in 7 patients. Round ligaments were involved in 7 patients, 9 patients had tubal disease. Deep pelvic endometriosis infiltrating the rectal wall was seen in 5 patients

Conclusion : In our study we were able to depict the commonest MRI imaging patterns in pelvic endometriosis in Kashmiri women. Indeed MRI is able to preoperatively detect maximum endometriotic lesions thereby improving diagnostic imaging accuracy and patients' outcome, and to reduce postoperative complication rates.

INTRODUCTION

Endometriosis is a relatively common gynaecological condition affecting premenopausal women often associated with pelvic pain and infertility. It is pathologically characterised as the presence of ectopic endometrial glands and stroma outside the uterus. Because its effects may be life impacting, radiologists should be familiar with the various imaging manifestations of the disease, especially those that are relatively specific for the disease. Endometriosis includes three different manifestations: ovarian endometriomas, peritoneal implants, deep pelvic endometriosis. The disease primarily located in pelvis although extra pelvic endometriosis may rarely occur. Although the definitive diagnosis is based on laparoscopy it is invasive with possible false negative results. Nowadays there is paradigm shift from surgical to non-invasive diagnosis based of clinical manifestations , response to therapy and imaging. Because the effects of endometriosis may be destructive, radiologists should be familiar with the various imaging manifestations of the disease, especially those that allow its differentiation from other pelvic lesions. Diagnostic imaging is often needed for treatment planning. Among imaging modalities, magnetic resonance imaging is often used as a problem-solving tool in complex cases and should be considered as a second line modality after ultrasound [1].

Presently, MRI is considered the best imaging technique for mapping endometriosis, as it provides a more reliable map of deep infiltrating endometriosis than physical examination and transvaginal ultrasound (TVUS) [2]. The current study is aimed at describing various imaging findings in pelvic endometriosis in Kashmiri women on 3T MRI.

MATERIALS AND METHODS

The current study is a cross sectional observational study conducted by reviewing already existing MRI images in the

radiology department of SMHS hospital Srinagar from October 2021 to December 2022. All the pelvic MRI studies of premenopausal females who had MRI features of endometriosis were included in the study. The MRI studies of these patients were re-evaluated and compiled by experienced radiologists with more than 8 years of experience in radiology. Exclusion criteria included a history of pelvic surgery for endometriosis or adnexal disease

The aim of our study is to describe the various common patterns of MRI manifestations of pelvic endometriosis in premenopausal women from Kashmir. MRI imaging is performed in a closed configuration superconducting 3-T system (Siemens MAGNETOM Skyra) by using Body 18 coil for better SNR.

The MRI imaging protocol we use in our institution includes the following:

T2 TSE coronal plane

T2 TIRM coronal plane

T2 TSE sagittal plane

T2 TSE axial plane

T1 TSE axial plane

T1 TSE FAT SAT axial plane

Post contrast T1 FAT SAT in axial, sagittal and coronal images were acquired wherever felt necessary based on presence of suspicious features like thick septations, solid components and/or mural nodules

After reviewing the MRI images of the study population over a period of thirteen months, we were able to gather 47 cases of MR documented endometriosis in our institution. We re-examined the cases to identify the key imaging patterns in our study population and tabulated the data for documentation.

RESULTS

We were able to identify a wide range of imaging findings in our study as summarised in Figures 1 and 2. The most common finding in our patient group was ovarian endometriosis seen in a total of 27 patients. Ovarian endometriosis manifested in following three ways on MRI:

superficial implants causing fibrous adhesions;

micro intra-ovarian endometriotic foci;

deep implants with repeated cyclic haemorrhage leading to endometriotic cyst/endometrioma formation.

A total of 19 cases had the presence of ovarian endometrioma in one or both ovaries. 7 of these cases were bilateral. At MR imaging the typical feature of endometriomas is the so called T2 shading sign, which can be seen on T2-weighted images as the name suggests. Its due to the chronic nature of endometriomas and is the result of cyclic bleeding occurring over time. Aged blood products contain high iron and protein concentrations which determine a decrease in

T2-relaxation time. Therefore, on T2-weighted images

endometriomas will show a gradual loss of signal within the lesion with low signal intensity till complete signal void in the dependant portion. Endometriotic cysts show high signal intensity on T1-weighted images. Fluid-fluid levels may also be present [6],[7]. Micro intra-ovarian endometriomas were seen in 3 patients these are characterised by <1cm multiple round lesions homogeneously hyperintense on fat-suppressed T1-weighted images due to hemorrhagic content. T2-weighted images show variable appearances

Among the 27 cases of ovarian endometriosis 5 cases had superficial ovarian implants. These are typically < 5mm in size and often missed on laparoscopy[5]

Adhesions were also a common finding with 16 patients showing evidence of this common complication of endometriosis. At MR imaging, especially on T2-weighted images, retractile adhesions were observed as spiculated hypointense peritoneal strands arranged in acute angles. Tethering of pelvic structures and loss of intervening fat planes, without appreciable nodular lesions, was another imaging finding suggestive of adhesions. Extensive adhesions were characterised by distorted pelvic anatomy, tilting of the uterine axis and obliteration of Douglas pouch. Posterior displacement of uterus and ovaries was seen in 13 patients, angulation of rectosigmoid colon and bowel loops was noted in 8 patients, elevation of the posterior vaginal fornix was seen in 6 patients. Hydrosalpinx/hematosalpinx were seen in 9 patients. These being possible indirect signs of adhesions:

deep infiltrating endometriosis characterised by solid deep lesions involving parametrium, retrocervical region, USL was seen in 14 patients;

deep infiltrating endometriosis—visceral solid endometriosis involving the rectal wall was observed in 5 patients.

A total of 7 patients had endometriotic involvement of anterior cul-de-sac which is also known as the vesicouterine pouch. In 5 of these patients there were peritoneal implants involving the serosal surface of the uterus with associated adhesions between bladder dome and anterior uterine serosa leading to an anteflexed uterus with an obliterated anterior cul-de-sac. 2 of these patients had deep endometriotic implants in the anterior myometrium with adjacent fibrous proliferation in the uterine serosa

leading to the vesicouterine space obliteration .

Seven of our patients had round ligament involvement. Broad ligament involvement was suggested by thickening and nodularity of these ligaments in three.

Endometriosis is the most common cause of hematosalpinx and peritubal adhesions in women of reproductive age.. Hematosalpinx was also seen our patients . 7 patients had single tube involvement where as bilateral tubal involvement was seen in 2 patients. At MR imaging hematosalpinx appears as a tortuous enlarged tubular adnexal structure filled with hemorrhagic fluid with high signal intensity endoluminal contents on fat suppressed T1-weighted images and intermediate signal intensity,with or without internal fluid-fluid level, on T2-weighted images [3].

The retrocervical area is a virtual extraperitoneal space behind the cervix, located above the rectovaginal septum [4]. It is a common site of deep pelvic endometriosis.17 patients in our study were seen to have retrocervical space involvement . 3 among these were associated with involvement of uterosacral ligaments. 10 of these patients had obliteration of pouch of Douglas and 13 had uterine retroflexion.

Rectovaginal space involvement was seen in 14 patients in the potential space between posterior vaginal wall and anterior wall of rectum. None of our patients had isolated vaginal lesions.

Among the bowel segments the rectosigmoid was the most commonly affected seen in 5 patients. The implants were generally involving the serosal surface. Muscular or submucosal involvement was not seen in our study. 3 of our patients had adhesions with pelvic small bowel loops characterised by their tethering and kinking, all involving ileal loops.

One of our patients had eccentric wall thickening of the endometrioma , subsequent to this suspicion, post contrast fat suppressed T1W images had been acquired which revealed avid enhancement of the thick cyst wall suspicious for malignancy.

The spectrum of findings in our study is summarised in figure no.1

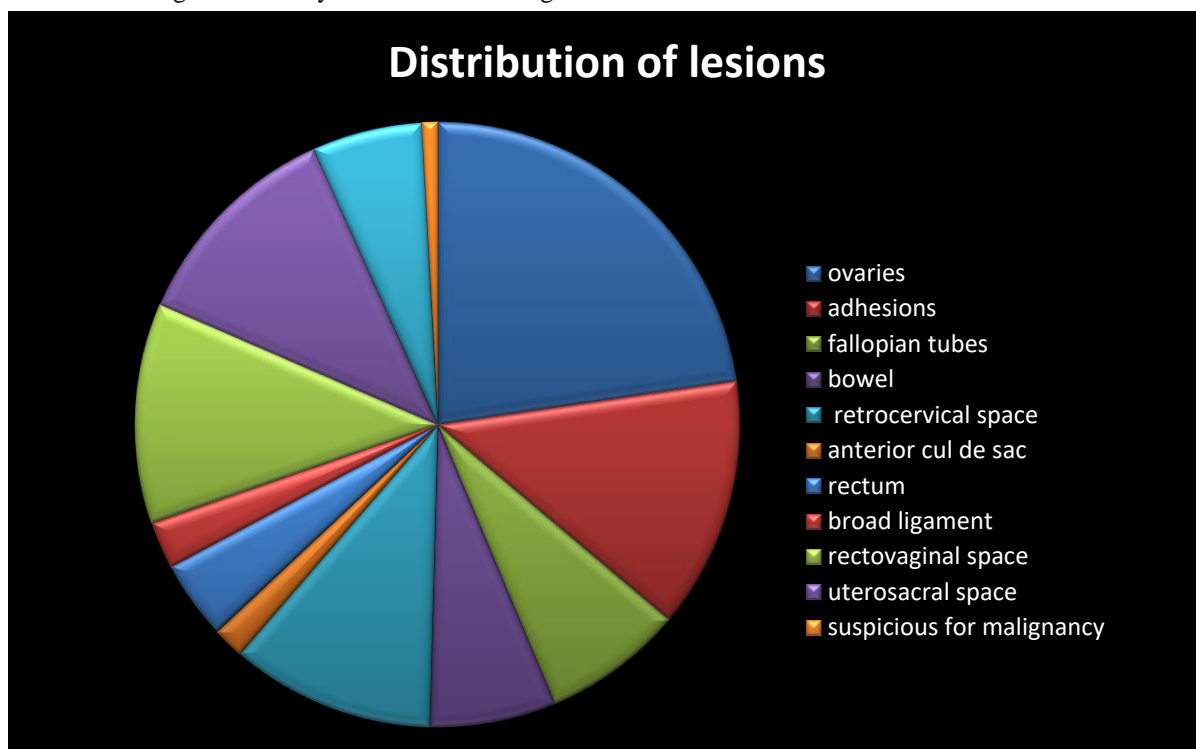


Figure 1

MAIN FINDINGS IN OUR STUDY
OVARIAN ENDOMETRIOSIS
ADHESIONS
DEEP PELVIC ENDOMETRIOSIS
ANTERIOR CUL DE SAC INVOLVEMENT
OBLITERATION OF POUCH OF DOUGLAS
MYOMETRIAL INVASION BY DEEP ENDOMETRIOTIC IMPLANTS
RECTAL WALL ENDOMETRIOSIS
ADHESIONS WITH BOWEL LOOPS
HEMATOSALPINX
UTEROSACRAL AND BROAD LIGAMENT INVOLVEMENT
ROUND LIGAMENT THICKENING

FIGURE 2

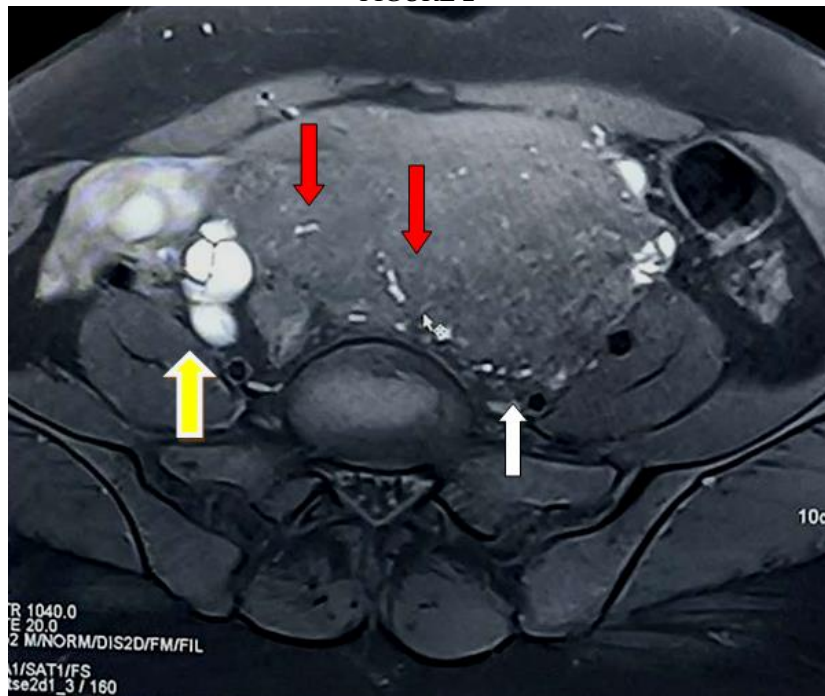


FIGURE 3 . AXIAL T1 W FS imaging demonstrating superficial peritoneal implants(white arrow) and right hematosalpinx (yellow arrow/). Also noted is the deep myometrial implants (red arrows)

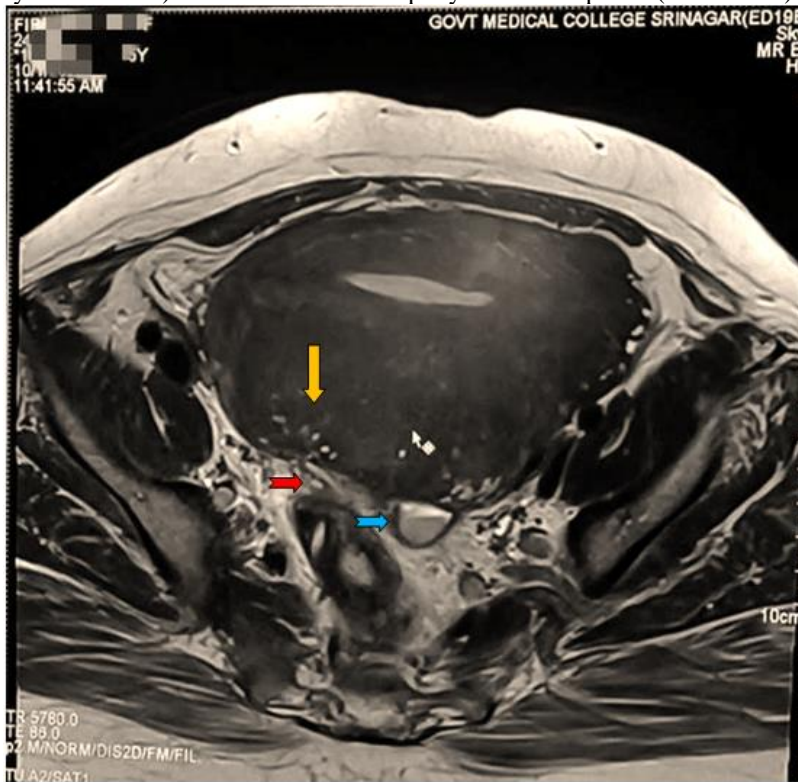


Figure 4 : Axial T2W image showing adherent ovary in posterior cul de sac with the T2 shading sign (blue arrow). Posterior cul de sac is almost obliterated by the adhesion strands as noted by the subtle T2 hypointensity (red arrow). Endometrial implants were noted in the posterior myometrium as characterised by T2 hyperintense cystic foci (yellow arrow)

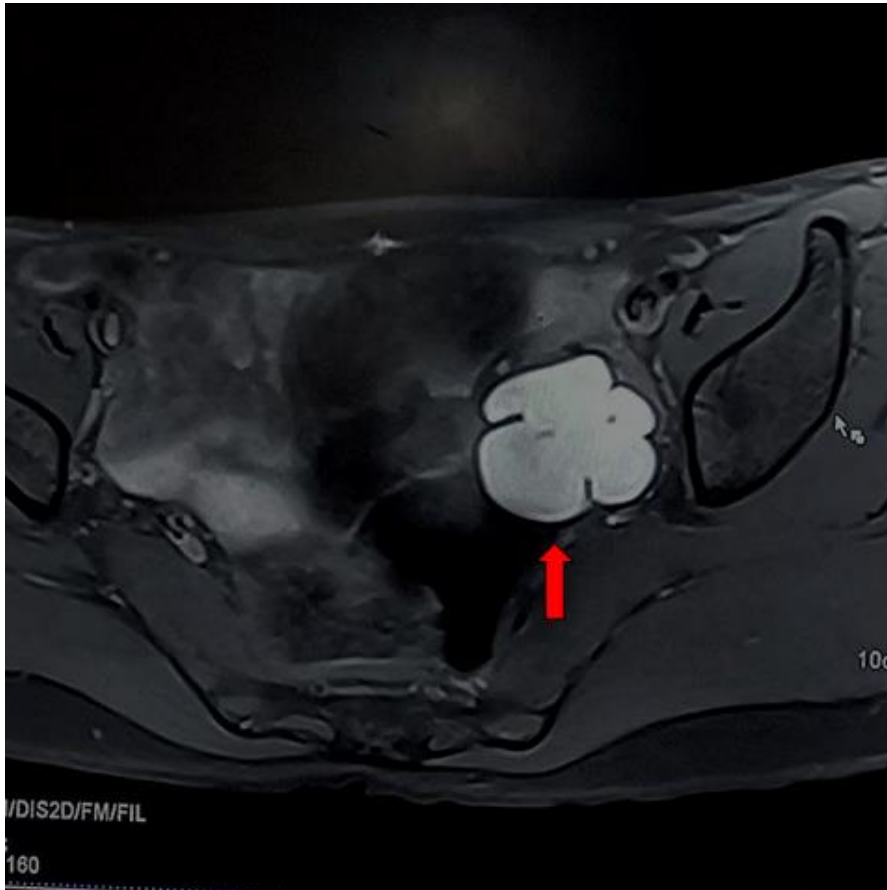


Figure 5. AXIAL T1 W FS imaging demonstrating left ovarian endometrioma with typical T2 shading sign (red arrow).

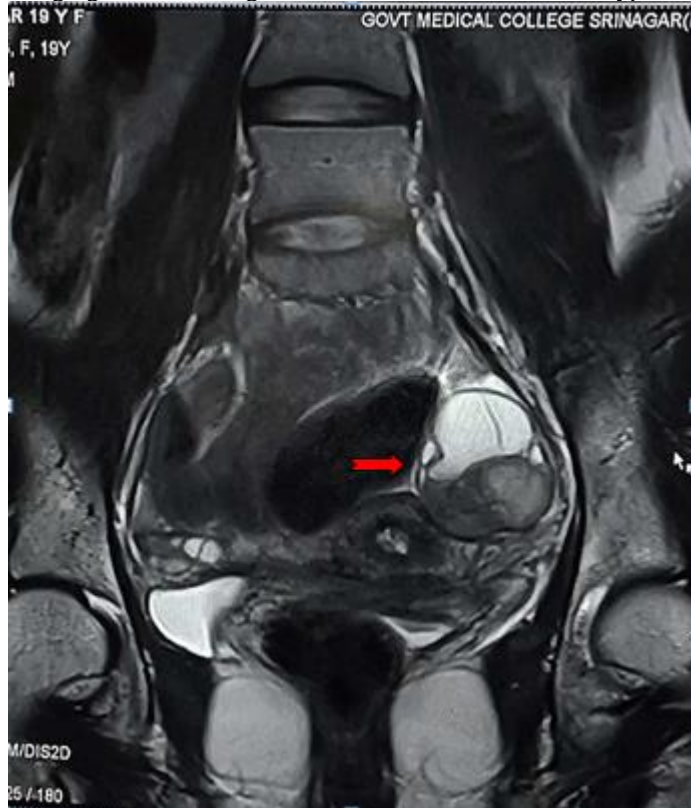


Figure 6 : T2 Coronal image of the same patient as figure 5 demonstrating T2 shading in the left ovarian cyst (red arrow)

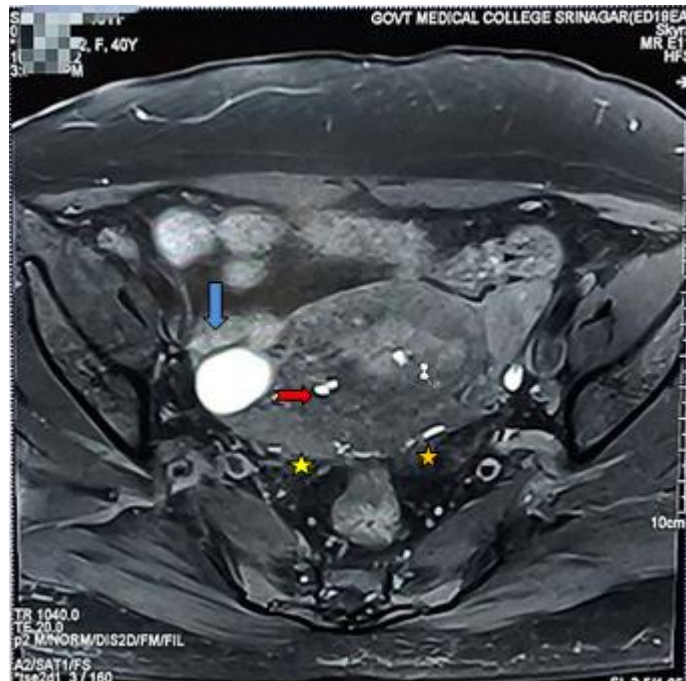


Figure 7 : Axial T1 fat suppressed images showing deep myometrial implants (red arrow), obliteration of posterior cul de sac (stars) and right ovarian endometrioma (blue arrow).



Figure 8 : sagittal T2 w image demonstrating multiple T2 shading small intraovarian implants (stars) along with one of the implants showing peripheral T2 hypointense rim due to hemosiderin staining (red arrow)

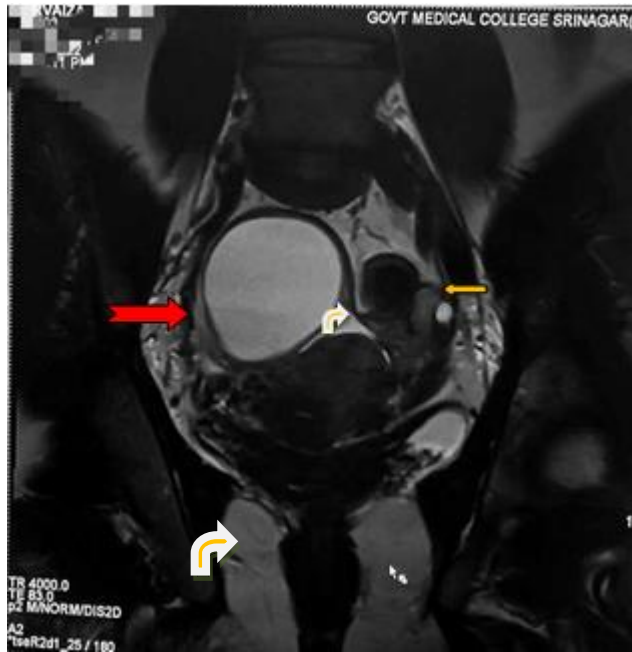


Figure 9 : T2 coronal images revealing typical T2 shading in the right ovarian endometrioma (red arrow). Both ovaries appear adherent to each other by a hypointense adhesion band (white arrow) . Note is made of dilated left fallopian tube with T2 shading in luminal contents (yellow arrow) .



Figure 10 : axial T2 weighted MRI showing hypointense thickening of the uterosacral ligaments (arrows)



Figure 11 : coronal T2 weighted image showing right hematosalpinx (red arrow).

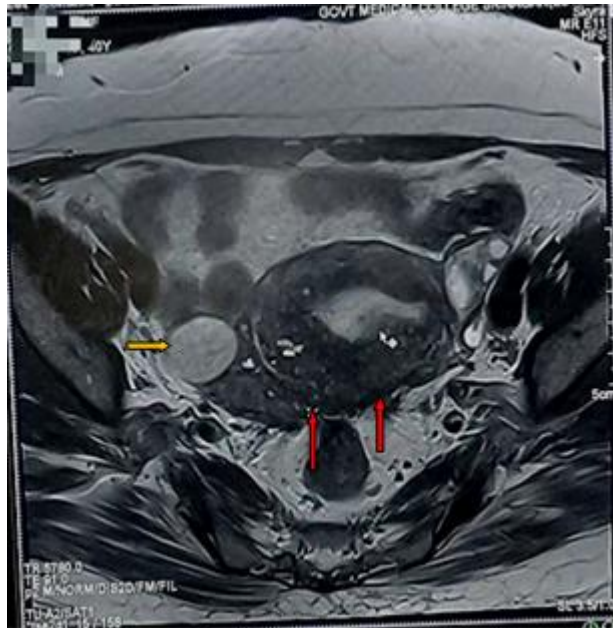


Figure 11 : axial T2 weighted image showing right ovarian endometrioma (yellow arrow) with hypointense fibrous strands obliterating the rectouterine space (red arrows)



Figure 12 : sagittal T2 weighted image demonstrating grossly dilated left fallopian tube with positive T2 shading sign (yellow arrow).

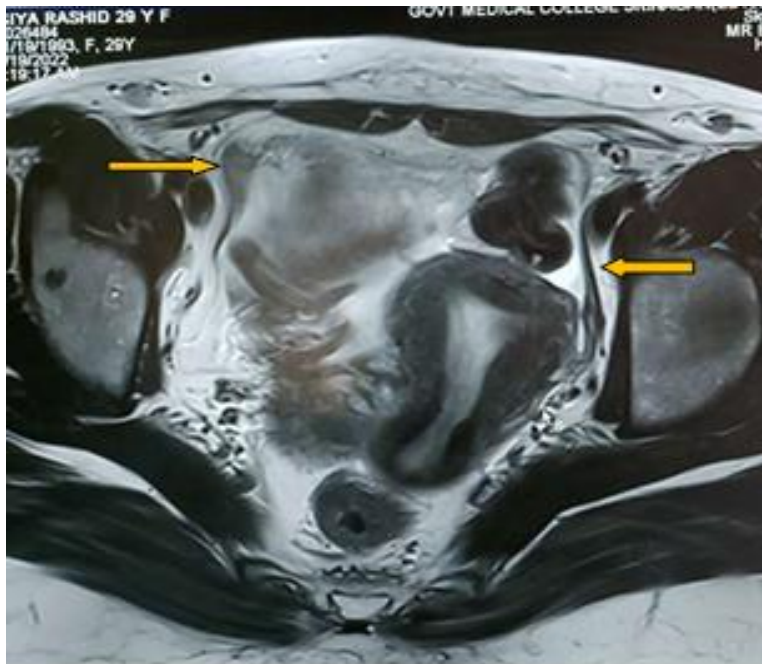


Figure 13 : axial T2W image showing hypointense thickening of round ligaments more on left side (yellow arrows) with left sided tilt of the uterus.

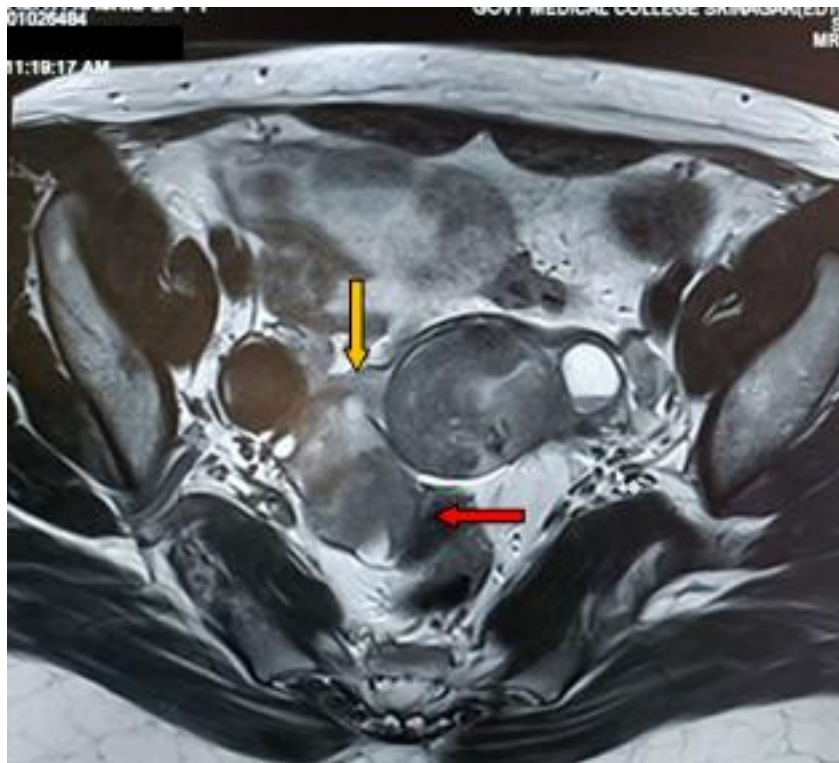


Figure 14 : axial T2W image showing bilaterally adherent ovaries (kissing ovaries) with intraovarian adhesion bands (yellow arrow) and recto-ovarian adhesion between right ovary and rectum (red arrow)



Figure 15 : axial T2W image showing adhesion between right ovary and the ipsilateral round ligament (red arrow) . Also noted is the ipsilateral endometrioma (yellow arrow) as well as the recto-ovarian adhesions (star)



Figure 16 : axial post contrast fat suppressed T1W images revealing kinking of the rectosigmoid junction due to adhesions (red arrow) . Note contrast enhancement of the paracolic fibrous strands .

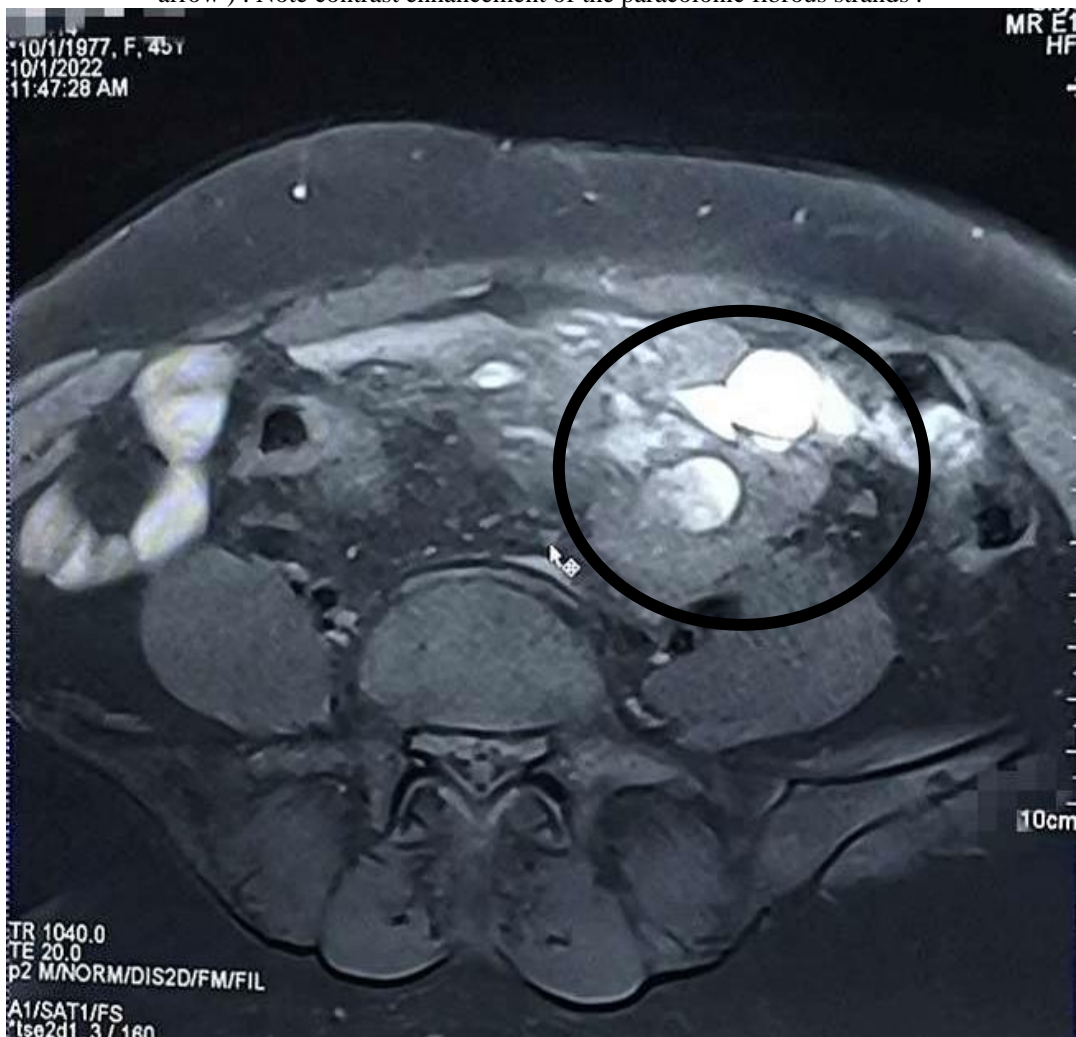


Figure 17 : axial T1W fat suppressed image revealed adhesions between left ovary and the small bowel loops giving an almost phlegmonous appearance (black circle)



Figure 18: Post contrast fat suppressed T1W images of the same patient as in figure 17 showing encasement of the bowel loop (star) by the enhancing endometriotic fibrous strands (arrows)



Figure 19: axial fat suppressed post contrast T1W images shows thick eccentric enhancing posterior wall of the endometrioma with an enhancing septum in the midline. These findings are suspicious for development of endometriosis related malignancy.

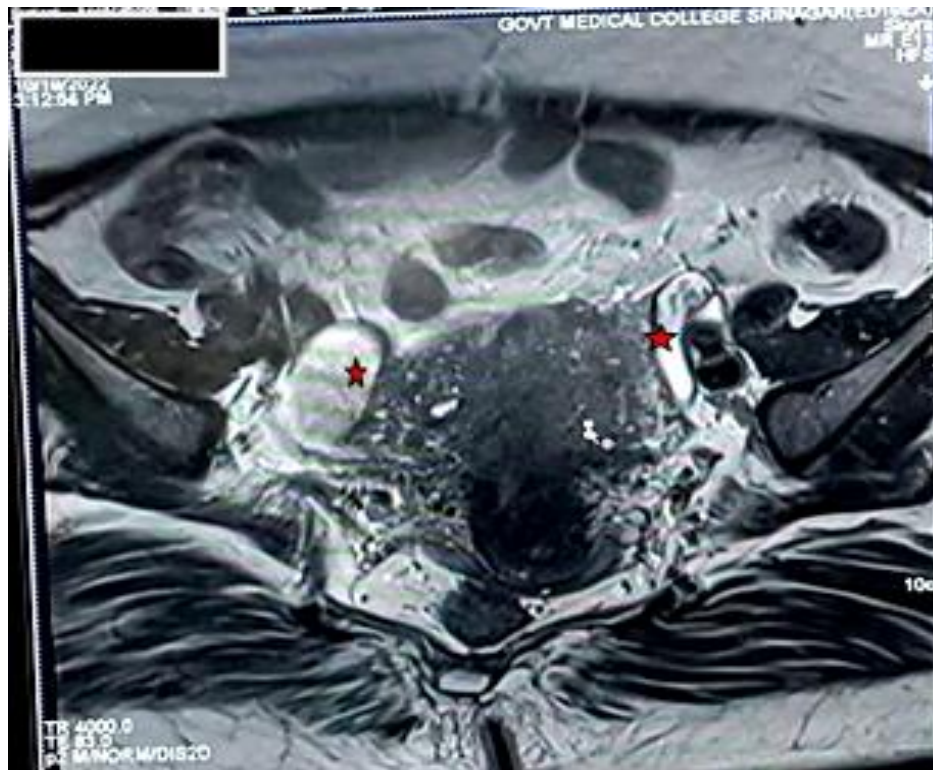


Figure 20 : coronal T2 W image showing bilateral hematosalpinx (star) with adherence of both tubes to the uterine serosa .

DISCUSSION

Endometriosis is a common gynecologic disorder primarily affecting women during their reproductive years. Pathologically, it is the result of functional endometrium located outside the uterus.

The physical manifestations are protean, with some patients being asymptomatic and others having disabling pelvic pain, infertility, or adnexal masses. Symptoms do not necessarily correlate with the severity of the disease. Ultrasonographic (US) features are variable and can mimic those of other benign and malignant ovarian lesions. Low-level internal echoes and echogenic wall foci are more specific US features for endometriomas. Magnetic resonance imaging improves diagnostic accuracy, with endometriotic cysts typically appearing with high signal intensity on T1-weighted images and demonstrating “shading” on T2-weighted images. The ovaries are the most common sites affected, but endometriosis can also involve the gastrointestinal tract, urinary tract, chest, and soft tissues

The prevalence of endometriosis is difficult to determine accurately. Endometriosis has been reported in 4.1% of asymptomatic women undergoing laparoscopy for tubal ligation. However, in the same study, 20% of women undergoing laparoscopic investigation for infertility and 24% of women with pelvic pain had endometriosis [6]. Overall prevalence, including both symptomatic and asymptomatic women, is estimated to be 5%–10% [8,9].

As expected radiologic evaluation of small endometriotic implants is limited; therefore, the radiologist’s role is generally to identify and evaluate endometriotic cysts. Ultrasonography (US) is the most common imaging modality used to evaluate suspected endometriosis. However, it is applicable only to the evaluation of endometriotic cysts; detection of adhesions or implants with US is only anecdotal. Magnetic resonance (MR) imaging has proved to be a very useful and more specific imaging technique and is often used as a problem-solving tool the confident US differentiation of endometriotic cyst from other adnexal masses may be difficult at times. MR imaging has been shown to have greater specificity for the diagnosis of endometriomas than other noninvasive imaging techniques [10–12]. It affords a larger field of view than US, and the effect of adhesions on surrounding anatomic structures is better depicted. Therefore, MR imaging can be a helpful adjunct for evaluation of adnexal masses.

The present study was done to identify the common patterns in MRI evaluation of Kashmiri women. The most common site of involvement in our patients was the ovaries(57%) .Lesions were present as superficial ovarian implants , intra ovarian endometriomas and most commonly ,the endometriotic cysts. This was similarly reported in multiple studies by various authors including Chamié LP et al (2011) and Bazot M et al (2011) [13,14] .Likewise endometriotic cysts were the commonest finding in our study .

Anterior cul-de-sac involvement was seen in many patients in our study (14.8%). Either peritoneal or deep endometriotic implants involving peritoneum covering the uterus often lead to adhesions between the peritoneal folds of the bladder and the uterus with ante flexion of the uterus and obliteration of the anterior cul-de-sac. Anterior cul-de-sac involvement has also been

documented Fritsch H et al in his study (2007) [15]

Paraauterine ,periovarian and peritubal adhesions were observed in 16 patients (34%) .These have also been reported by multiple authors including Ghezzi F, et al (2005) [16] and Nisenblat V et al (2016) [17] among many others.

Hematosalpinx was observed in 9 patients (19%). Endometriosis remains the commonest cause of hematosalpinx as reported by Hill CJ et al in 2020 .[18]. At MR imaging hematosalpinx appears as a tortuous enlarged tubular adnexal structure filled with hemorrhagic fluid. We observed high sig endoluminal intensity on fat-suppressed T1-weighted images and intermediate signal intensity, with or without internal fluid-fluid level, on T2-weighted images, similar to observations of Foti PV et al (2016) [19] . According to Siegelman the presence of T1-weighted hyperintensity within a dilated fallopian tube is suggestive of endometriosis(2012) [20], we also reported similar findings on T1W images.

CONCLUSION

Due to its ability to perform a complete assessment of all pelvic compartments at one time, MRI represents the best imaging technique for preoperative staging of endometriosis, in order to choose the optimal surgical approach and to plan a multidisciplinary treatment protocol. In our study we were able to depict the commonest MRI imaging patterns in pelvic endometriosis in Kashmiri women. Indeed MRI is able to preoperatively detect maximum endometriotic lesions thereby improving diagnostic imaging accuracy and patients' outcome, and to reduce postoperative complication rates. The recent awareness that endometriosis may be medically treated and that laparoscopy should be intended for surgical treatment, not for diagnostic purposes , enhances the role of non-invasive diagnostic procedures and particularly of MR imaging.

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