

Original Research

Role of MRI in detection of female infertility

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ABSTRACT:

Background: Approximately 10% of married couples experience infertility. The effects are similar for both sexes. The present study assessed the role of MRI in detection of female infertility. **Materials & Methods:** 62 women aged 18- 37 years of infertility were enrolled and a comprehensive evaluation of the pelvis was performed. All were subjected to MRI. **Results:** The age group 18-27 years had 32 and 28-37 years had 30 patients. The difference was non- significant ($P > 0.05$). Causes of female infertility was tubal disease in 12, leiomyoma in 5, pelvic inflammatory disease in 13, endometriosis in 8, PCOS in 7, adenomyosis in 2 and endometrial polyps in 10 cases. The difference was significant ($P < 0.05$). **Conclusion:** Magnetic resonance imaging (MRI) is an excellent non-invasive, radiation-free method for assessing female infertility because of its better soft-tissue contrast resolution and multiplanar evaluation, which yield precise anatomical features.

Keywords: Infertility, MRI, Women

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INTRODUCTION

The World Health Organization defines infertility as the inability to conceive a clinical pregnancy after 12 months or more of regular, unprotected sexual activity. Reproductive technologies are always changing. As such, it is critical to make the most accurate assessment possible of infertile women.¹ For female infertility, a multimodality approach to diagnostic work-up is required to identify the organic reasons of infertility and to guide clinical care.

Approximately 10% of married couples experience infertility. The effects are similar for both sexes. The causes of infertility in women can be roughly categorized into the following groups: uterine causes, which include congenital defects, infections, uterine synechiae, localized lesions, intrauterine scars, cervical stenosis, and changes in endometrial thickness and vascularity.² Ovarian causes include endometriosis, stromal vascularity, and anomalies related to follicles and ovulation. Tubal reasons include blockage and infections, for instance. Imaging modalities include sono-hysterography, MRI, transvaginal and transabdominal ultrasonography, and

hysterosalpingography (HSG) are part of a radiologist's toolkit.³ Magnetic resonance imaging is the most efficient way to ascertain the direction and form of pelvic structures (MRI).³

It is expensive and scarce, making it challenging to replicate even though it is non-invasive and radiation-free. A prolonged examination time, the difficulty in identifying sub-centimeter uterine lesions, and the incapacity to classify endometriomas at specific phases are some further drawbacks.⁴ MRIs should not be performed on patients who have cardiac pacemakers or cochlear implants. MRI can also identify pathological abnormalities, such as tubal lesions and pituitary adenoma. It helps with prognosis prediction in conservatively treated instances of leiomyoma, adenomyosis, and endometriosis.^{5,6} The present study assessed the role of MRI in detection of female infertility.

MATERIALS & METHODS

This study consisted of 62 women aged 18- 37 years of infertility. A valid written consent was obtained from all patients.

A comprehensive evaluation of the pelvis was performed. It was noticed that symptoms including dysmenorrhea and pelvic discomfort existed. An hCG serum test was performed before the examinations. In the supine position, the patient had an MRI on a 1.5 Tesla machine. The following sequences were acquired: – T2-weighted (T2W) turbo spin-echo (TSE) sequences in axial and sagittal planes with: echo time (TE), 90 ms; repetition time (TR), 4,500

ms; field of view (FOV), 250 x 230; slice thickness, 3.0 mm/1.0 mm. – T1-weighted (T1W) TSE sequence in sagittal plane with: TE, 7 ms; TR, 627 ms; FOV, 250x207; slice thickness, 3.0 mm/1.0 mm. – T1W TSE sequence in axial plane with fat suppression (SPIR sequence). On MRI various anomalies were recorded. Results thus obtained were subjected to statistical analysis. P value below 0.05 was considered significant.

RESULTS

Table I Age-wise distribution

Age group (Years)	Number	P value
18-27	32	0.91
28-37	30	

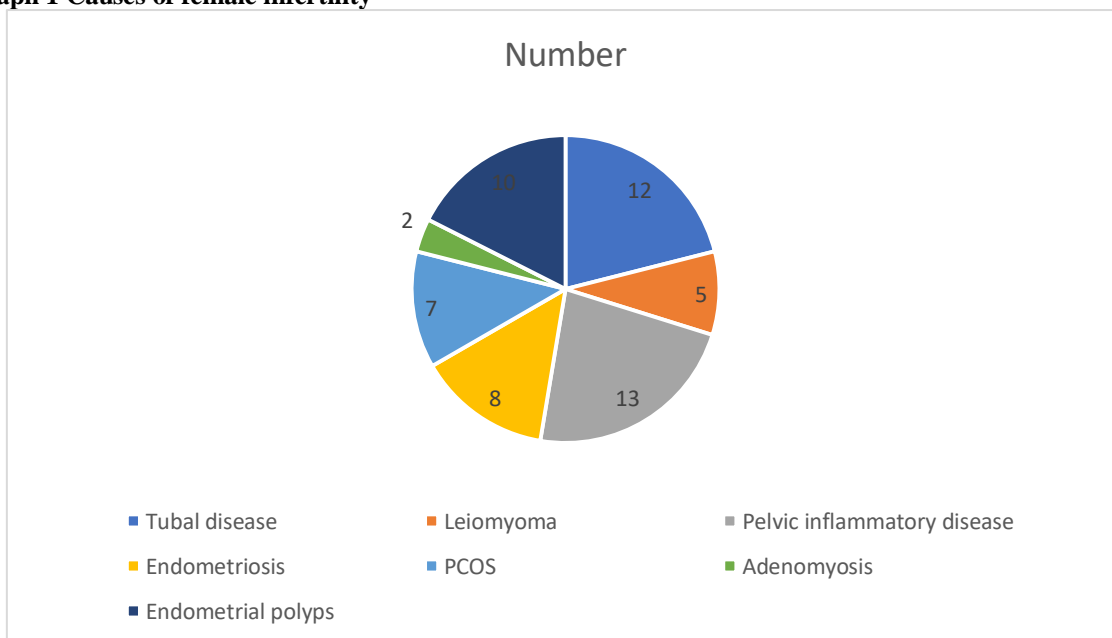
Table I shows that the age group 18-27 years had 32 and 28-37 years had 30 patients. The difference was non-significant (P> 0.05)

Table 2 Causes of female infertility

Causes	Number	P value
Tubal disease	12	0.01
Leiomyoma	5	
Pelvic inflammatory disease	13	
Endometriosis	8	
PCOS	7	
Adenomyosis	2	
Endometrial polyps	10	

Table II, graph I shows that causes of female infertility was tubal disease in 12, leiomyoma in 5, pelvic inflammatory disease in 13, endometriosis in 8, PCOS in 7, adenomyosis in 2 and endometrial polyps in 10 cases. The difference was significant (P< 0.05).

Graph 1 Causes of female infertility



DISCUSSION

In the era of evidence-based medicine, magnetic resonance imaging is an essential diagnostic and therapeutic tool for female infertility.^{7,8} When it comes to precisely identifying endometriosis and adenomyosis, complex tubo-ovarian diseases,

leiomyomas, and significant pelvic inflammation, magnetic resonance imaging (MRI) outperforms transvaginal sonography in terms of diagnosis.⁹ MRI guides the course of treatment by mapping the location and vascularity of leiomyomas before surgery. MRIs can provide a reliable diagnosis of

endometriosis and intrauterine adhesions, eliminating the need for invasive diagnostic procedures like laparoscopy and hysteroscopy.^{10,11} Magnetic resonance imaging (MRI) is considered the gold standard of care for patients with Mullerian duct anomalies due to its excellent spatial resolution, which offers exact anatomical information about these diseases.^{12,13,14} The present study assessed the role of MRI in detection of female infertility.

We found that the age group 18-27 years had 32 and 28-37 years had 30 patients. Badawy et al¹⁵ determined the accuracy of magnetic resonance (MR) imaging for the diagnosis of pelvic lesions associated with female infertility. 423 infertile women were investigated by hysterosalpingography (HSG), transabdominal and transvaginal ultrasonography after thorough clinical examination. Hundred and thirty (30.95%) patients were associated with pelvic lesions not conclusively diagnosed by HSG or/and ultrasonography and were examined by MR imaging to confirm the diagnosis. Fifty-four patients (41.53%) had uterovaginal lesions. The diagnosis by MR imaging was conclusive for 11 cases of pyosalpinx, 3 cases of hematosalpinx, 25 cases of hydrosalpinx, 24 cases of ovarian endometriomas, deep endometriosis of the of rectosigmoid (3 cases), urinary bladder (3 cases), one case of endometriosis of the abdominal wall after repeated cesarean sections and six ovarian tumors, 5 cases of benign cystic teratoma and 1 case of serous cystadenocarcinoma. The diagnosis of these lesions was confirmed by laparoscopy or laparotomy and histopathological examination. Magnetic resonance imaging failed to diagnose peritubular adhesions in 22 out of 39 cases (56.41%) of tubal lesions and peritoneal implants of endometriosis in 12 out of 31 cases (38.70%) of pelvic endometriotic lesions. They were discovered during the surgical treatment of the tubal and ovarian lesions through laparoscopy or laparotomy.

We observed that causes of female infertility was tubal disease in 12, leiomyoma in 5, pelvic inflammatory disease in 13, endometriosis in 8, PCOS in 7, adenomyosis in 2 and endometrial polyps in 10 cases. Yang et al¹⁶ found that tubal infertility diagnosed by laparoscopy accounted for 32.8% of infertile patients. Among them, pelvic tuberculosis occupied 63.6%, while nonspecific inflammatory disease (NSID) 36.4%. 44.8% of tuberculosis and 62.2% of NSID group had negative findings during pelvic examination. Four types of tuberculosis lesions were demonstrated: miliary ascites (9.4%), adherent mass (35.8%), adhesion and calcification (43.1%), nodular sclerosis (11.7%). In the NSID group, simple tubal obstruction accounted for 29.9%, the remaining were mild adhesion or hydrosalpinx. Complete tubal occlusion occupied 81.2% in tuberculosis group and 70.7% in NSID cases. In the tuberculosis group the positive rate of pelvic lesion biopsy and endometrial biopsy was only 59.1% and 20.5% respectively.

Chamie et al¹⁷ evaluated the accuracy of preoperative magnetic resonance imaging (MRI) findings relative to surgical presence of deeply infiltrating endometriosis (DIE). DIE was confirmed at histopathology in 77 of the 92 patients (83.7%). Sensitivity, specificity, positive predictive value, negative predictive value, and accuracy of MRI to diagnose DIE at each of the specific sites evaluated were as follows: retro cervical space (89.4%, 92.3%, 96.7%, 77.4%, 90.2%); rectosigmoid (86.0%, 92.9%, 93.5%, 84.8%, 89.1%); bladder (23.1%, 100%, 100%, 88.8%, 89.1%); ureters (50.0%, 100%, 95.5%, 95.7%); and vagina (72.7%, 100%, 100%, 96.4%, 96.7%).

CONCLUSION

Magnetic resonance imaging (MRI) is an excellent non-invasive, radiation-free method for assessing female infertility because of its better soft-tissue contrast resolution and multiplanar evaluation, which yield precise anatomical features.

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