

VAGINAL SEPTUM AND OTHER CAUSES OF INFERTILITY USING MRI BASED ENDOVAGINAL GEL INSTILLATION TECHNIQUE

Syed Shariqullah, Sadaf Nasir, Bushra Rehan, Muhammad Ayub Mansoor

Department of Radiology, Liaquat National Hospital, Karachi, Pakistan.

PJR July - September 2018; 28(3): 193-199

ABSTRACT

OBJECTIVE: To determine the frequency of vaginal septum and other causes of infertility using MRI based endovaginal gel instillation technique. **METHODS:** A retrospective, cross-sectional study was performed on 50 infertile patients who had a strong clinical suspicion of vaginal septum based on history and clinical examination comprising bimanual gynecological examination and speculoscopy. MRI was performed on these 50 patients and 08 patients who were diagnosed as vaginal septum were subjected to endovaginal gel instillation technique in order to diagnose its obstructed or non-obstructed type. The data was collected over a period of 01 year; from 01st January 2017 to 31st December 2017. The study center was the Department of Radiology, at Liaquat National Hospital, Karachi. **RESULTS:** Out of these 50 infertile patients which were under 40 years, 16 patients (32%) had hydrosaplinx, 8 patients (16%) had hemorrhagic cyst, 7 patients (14%) had endometriotic cyst, 5 patients (10%) had hematocolpos, 4 patients (8%) had bicornuate uterus, 2 patients (4%) had OHVIRA syndrome. Only 08 patients (16%) had vaginal septum out of which 4 patients (8%) had obstructed while 4 patients (8%) had non-obstructed vaginal septum diagnosed on endovaginal gel instillation technique. **CONCLUSION:** The MR imaging gel instillation technique shown by our single center study is considered to be a useful, beneficial and minimally invasive approach for diagnosing obstructed and non-obstructed vaginal septum. We also believe that this method will be recognized as a superior diagnostic approach in patients suffering from vaginal endometriosis and thus help the gynecologists in planning effective therapeutic strategies.

Keywords: Endovaginal gel instillation, MRI scan

Introduction

MRI is superior in demonstrating tissue contrast in congenital mullerian anomalies, however, it may be difficult to distinguish vaginal borders owing to the normally collapsed vaginal walls. Instilling a contrast medium can adequately expand and fill the vagina, thus enhancing the visualization of vaginal anatomy and pathology. This technique provides an objective and reproducible way of measuring the level and thickness of a vaginal septum. This is important information preoperatively, as it will determine the route of operation (perineal or combined approach)

and the need for using bowel mucosa or skin to line a large vaginal defect.^{1,2,3}

MRI has gained ground in the evaluation of vaginal diseases due to its increasing availability and technological developments, which has allowed the development of faster and better quality protocols. Such protocols characterize the vaginal anatomy in detail, as well as its relationship with pelvic structures, besides allowing for a dynamic study during Valsalva maneuver, in the clinical suspicion of perineal descent. Additionally, diffusion and perfusion techniques have

Correspondence : Dr. Sadaf Nasir
Department of Radiology,
Liaquat National Hospital,
Karachi, Pakistan.
Email: dr.sadaf@live.com

Submitted 13 March 2018, Accepted 5 June 2018

the potential to provide functional data to the traditional anatomical study.⁴ The imaging protocol included a T1-weighted (W) turbo spin-echo (TSE), a T2-W TSE, a T1-W TSE fat-saturation, performed in the transverse plane (perpendicular to axis of cervix). A T2-W TSE sequences and a T1-W TSE fat-saturation were performed on sagittal plane. The transverse and sagittal T2-W TSE and the transverse and sagittal T1-W TSE fat-saturation sequences were performed before and after the introduction of ultrasonographic gel into the vaginal canal. No intravenous contrast medium was administered.

There is no consensus in the literature regarding use of vaginal contrast. Therefore, the use of vaginal contrast remains optional. Vaginal gel is useful for the evaluation of cervical cancer patients, especially in the subgroup who do not undergo evaluation under anesthesia. About 20-30 ml of warm ultrasound gel is placed in the vagina after positioning the patient on the table. Usually, vaginal contrast is well tolerated and does not cause any significant discomfort. Vaginal opacification with gel provides high signal intensity on T2W images and enables excellent definition of vaginal fornices and cervix, allowing for accurate assessment of vaginal involvement, especially in tumors with an exophytic cervical component.^{5,6,7} The vaginal walls are normally collapsed and therefore difficult to evaluate. There are some difficulties in adequate visualization of fibro-fatty components of vaginal septum. Therefore vaginal distension by opacification with ultrasound gel could help to delineate the cervix, vaginal fornices and hence is a helpful tool in not only detecting vaginal septum but also in diagnosing endometriosis.⁸

Material and Methods

A retrospective, cross-sectional study was performed on 50 infertile patients who had a strong clinical suspicion of vaginal septum based on history and clinical examination comprising bimanual gynecological examination and speculscopy. MRI was performed on these 50 patients and 08 patients who were diagnosed as vaginal septum were subjected to endovaginal gel instillation technique in order to diagnose its obstructed or non-obstructed type.

Consent was obtained from these patients. Patient lies in supine position with knees flexed, legs abducted. The aseptic technique includes usage of a vaginal speculum and the area was cleaned and sterilized with chlorhexidine. The operator uses 30 - 40 ml of water based aqueous gel (Aquasonic® 100 - ultrasound transmission gel) in 50 cc syringe, which is injected into the vaginal cavity resulting in its adequate distension. Care was taken to expel all air bubbles from the syringe during gel instillation. T2 weighted images were taken in sagittal and coronal planes. The data was collected over a period of 01 year; from 01st January 2017 to 31st December 2017. The study center was the Department of Radiology, at Liaquat National Hospital, Karachi. Approval of the Ethical Review Committee of the institution was obtained before the data collection. Full confidentiality of patients was maintained. All examinations were performed on a 1.5 Tesla MRI scanner (Toshiba

Hydrosalpinx	16 Patients	32.0%
Hemorrhagic cyst	08 Patients	16.0%
Endometriotic cyst	07 Patients	14.0%
Hematocolpos	05 Patients	10.0%
Bicornuate uterus	04 Patients	08.0%
OHVIRA syndrome	02 Patients	04.0%
Obstructed vaginal septum	04 Patients	08.0%
Non-obstructed vaginal septum	04 Patients	08.0%

Table 1: MRI findings in 50 infertile patients including endovaginal gel instillation in 16 patients

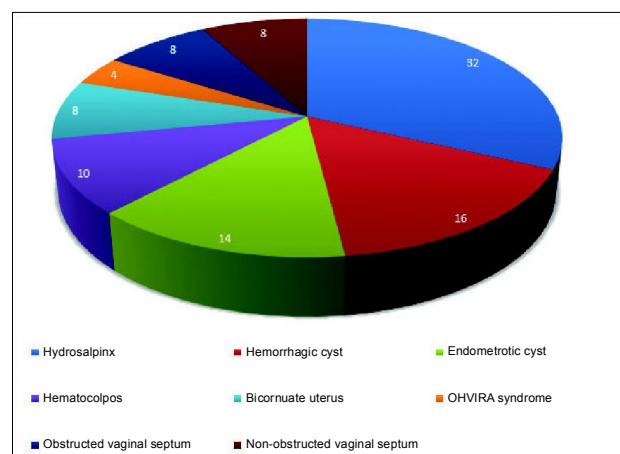


Figure 1: Diagrammatic illustration of MRI findings in 50 infertile patients including endovaginal gel instillation in 16 patients in terms of percentage

Class	Clinical Characteristics and Complications	US Features	MR Imaging Features	Interventional Procedure
I transverse vaginal septum; originates 5th month of pregnancy	Imperforate, cyclic pelvic pain and primary amenorrhea; microperforated, dyspareunia and dysmenorrhea; complications, endometriosis, urinary retention	Hematocolpos can be visualized	Location and thickness of the septum are delineated	Thin septum, excision with end-to-end anastomosis; thick septum, mobilization of upper vagina, possible Z-plasty technique; high septum, exploratory laparotomy may be required
II, longitudinal vaginal septum; originates 5th month of pregnancy	Obstructed, normal menses (unilateral obstruction) or amenorrhea (bilateral obstruction) with cyclic pelvic pain; unobstructed, difficulty with sexual intercourse or vaginal delivery; complications, endometriosis, urinary retention	Septum cannot be visualized	Vaginal septum is best visualized in the coronal or axial plane as a thin, low-signal-intensity area	Obstructed, surgical excision of the septum; unobstructed, surgical resection if patient experiences difficulty with sexual intercourse or vaginal delivery

Table 2: Clinical characteristics, imaging features and management of vaginal septum anomalies.

Activion 16 slice MR scanner). MRI scans (collimation. 4 x 2.5mm; reconstruction section thickness, 4mm; reconstruction intervals, 4mm) were obtained. MRI scans were retrospectively reviewed on PACS workstations and a constellation of findings were recorded; including dilated tubular fluid signal intensity convoluted structures in adnexa representing hydrosalpinx (Fig. 2a), Heterogeneous complex cystic areas

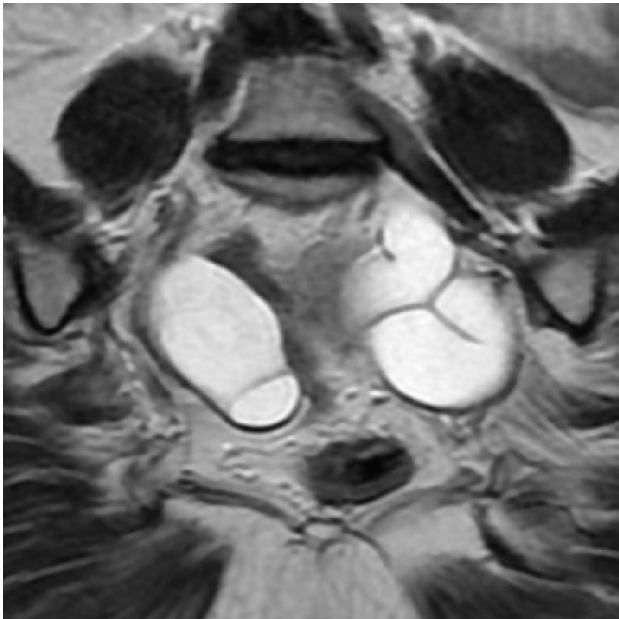


Figure 2a: MRI T2 weighted Coronal Image: Dilated tubular fluid signal intensity convoluted structures are seen in both adnexa representing Hydrosalpinx.

in either adnexa with low signal intensity on T2 and intermediate to high signal intensity on T1 weighted images representing hemorrhagic cyst (Fig. 2b), Large cystic area with septae showing intermediate to low signal intensity on T1 and high signal intensity on T2 weighted images representing endometriotic cyst (Fig. 2c), Distension of vaginal cavity by blood representing hematocolpos (Fig.3a), Two separate uterine horns with endometrial cavities representing bicornuate uterus (Fig. 3b), Uterine didelphys with obstructed vagina and renal agenesis suggestive of OHVIRA syndrome (Fig. 3c). Wedge shaped vaginal septum were observed by endovaginal gel instillation technique and its thickness and distance from vaginal

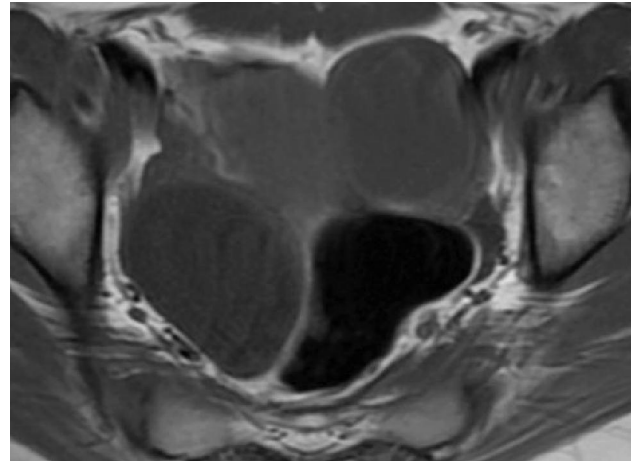


Figure 2b: MRI T1 weighted Axial Image: Heterogeneous complex cystic areas are seen in both adnexa with intermediate signal intensity on T1 weighted images representing Hemorrhagic cyst.

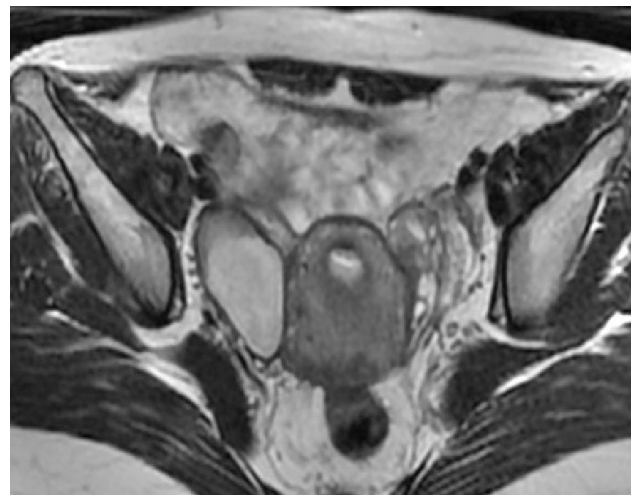


Figure 2c: MRI T2 weighted Coronal Image: Large cystic area is seen in right adnexa with high signal intensity on T2 weighted images representing Endometriotic cyst.

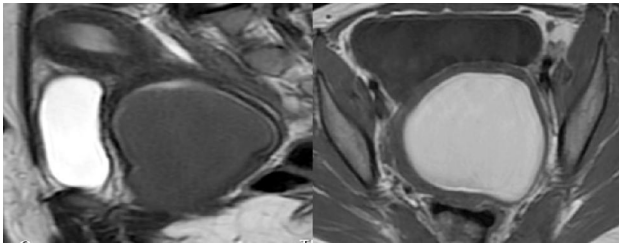


Figure 3a: MRI T2 weighted Sagittal and T1 weighted Coronal Images: Distension of vaginal cavity by blood is noted (Low signal intensity on T2 and High signal intensity on T1 weighted images). Findings represent Hematocolpos.

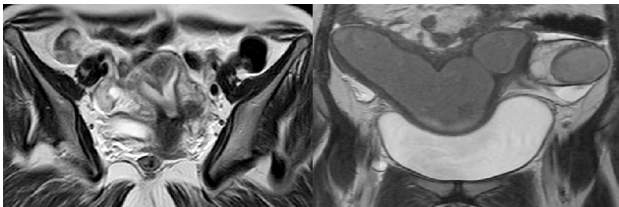


Figure 3b: MRI T2 weighted Coronal Images: Two separate uterine horns with endometrial cavities are noted representing Bicornuate uterus.

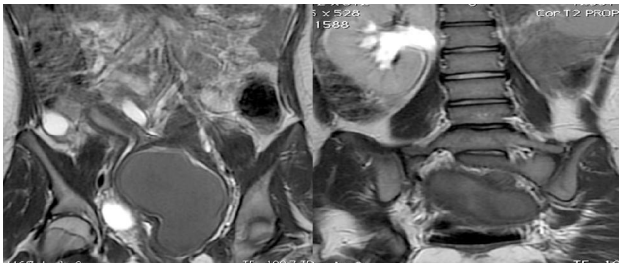


Figure 3c: MRI T2 weighted Coronal Images: There is duplication of uterus with widely divergent corporal horns and separate cervixes and vagina representing Uterus didelphys. Hematocolpos with left renal agenesis is also noted. Findings are suggestive of OHVIRA syndrome (Obstructed hemivagina and ipsilateral renal anomaly)

orifice was assessed and was classified as either obstructed or non-obstructed type. (Fig. 4a and 4b).

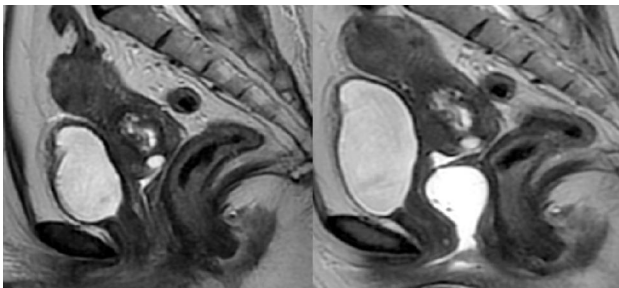


Figure 4a: MRI T2 weighted Sagittal Images before and after gel instillation: Endovaginal gel instillation technique demonstrates a thick wedge shaped complete vaginal septum along proximal aspect causing vaginal distension, representing an obstructed vaginal septum.

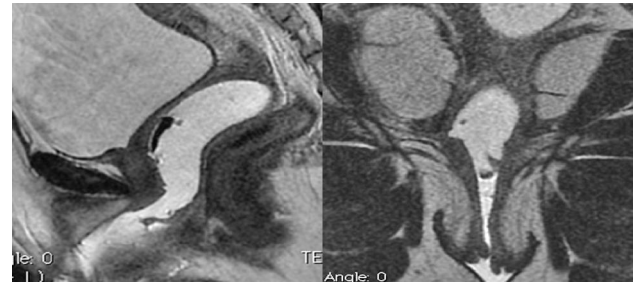


Figure 4b: MRI T2 weighted Sagittal and Coronal Images: Endovaginal gel instillation technique demonstrates a thin partial vaginal septum along distal aspect. A tiny defect is identified within the septum anteriorly representing a non-obstructed vaginal septum.

Results

Out of these 50 infertile patients which were under 40 years, 16 patients (32%) had hydrosalpinx, 8 patients (16%) had hemorrhagic cyst, 7 patients (14%) had endometriotic cyst, 5 patients (10%) had hematocolpos, 4 patients (8%) had bicornuate uterus, 2 patients (4%) had OHVIRA syndrome. Only 08 patients (16%) had vaginal septum out of which 4 patients (8%) had obstructed while 4 patients (8%) had non-obstructed vaginal septum diagnosed on endovaginal gel instillation technique (Tab. 1 and Fig. 1a).

Discussion

The prevalence of Mullerian duct anomalies, although rare, ranges from 0.001% to 10% in general population and 8 - 10% in women with an adverse reproductive history. Among these anomalies, imperforate hymen is the most common anomaly with an incidence of 1/1,000 to 1/10,000. Transverse vaginal septum (TVS) with a prevalence of 1 in 30,000 to 1 in 80,000 women is rarer than imperforate hymen. Both obstructive vaginal malformations may be asymptomatic in childhood. Most of the cases become symptomatic after menarche.^{9,10}

Transverse vaginal septum results from incomplete fusion between the vaginal components of the mullerian ducts and the urogenital sinus. A transverse vaginal septum divides the vagina into two segments, reducing its functional length and in most situations resulting in outlet tract obstruction. These septa are located in the upper vagina in 46% of cases but can

also be located in the mid (40%) or lower (14%) vagina. Clinical presentation depends on whether it is complete or partial. With complete septum, the menstrual blood accumulates in the genital tract resulting in hematocolpos and hematometra. Such patients usually present with cyclic lower abdominal pain and occasionally lower abdominal mass (hematometra) may be palpable. Incomplete septum may manifest later in life, allows partial egress of menstrual blood and such patients complain of dysmenorrhea and dyspareunia.^{11,12,13}

Clinical examination of the vulva will yield normal findings if the septum is in the mid or upper vagina, but a valsalva maneuver will reveal a bulging vaginal membrane if the septum is in the lower vagina. MR imaging can be useful in depicting the pelvic anatomy, help determine the thickness of the vaginal septum, and aid in the selection of the appropriate surgical technique. Identification of the cervix on MR images is crucial for differentiating a high septum from congenital absence of the cervix.¹⁴

Longitudinal vaginal septum may occur in association with uterine anomalies, most commonly in cases of uterus didelphys. Only some of the individuals who present with a longitudinal vaginal septum will be found to have a normal uterine cavity. Many cases go unrecognized because these septa do not necessarily involve a functional disorder. Longitudinal vaginal septum is thought to develop as a consequence of either failure of fusion of the lateral müllerian ducts, resulting in duplication of the uterus, cervix (uterus didelphys), and vagina; or incomplete resorption of the vaginal septum, which may or may not be obstructive. Patients may experience difficulty with sexual intercourse or vaginal delivery. Other manifestations will depend on whether an additional anomaly (with or without obstruction) is present. Longitudinal vaginal septum alone does not have an impact on fertility rates or obstetric outcomes.¹⁵

Diagnosis of vaginal septum can be confirmed either by sonography or magnetic resonance imaging (MRI). Saline contrast sonohysterography (SHG) is an alternative technique in which the endometrial cavity is distended with saline during ultrasonic examination and it permits single layer evaluation of the endometrial lining and enables the sonologist to reliably distinguish focal from diffuse endometrial pathologic conditions. The transvaginal ultrasound probe is inserted in this

technique and approximately 10 ml of sterile saline solution is injected slowly through the catheter under direct sonographic visualization. Multiple sagittal and coronal images are obtained. It is helpful in detection of the endometrial cavity for the presence of polyps, submucous fibroids, focal endometrial thickenings or other pathologic conditions.²⁰ Feasibility of saline contrast hysterosonography is approximately similar to diagnostic hysteroscopy in an outpatient setting. Saline infusion sonohysterography in the evaluation of postmenopausal bleeding is more economical and less painful. It helps in decision making, segregates high risk patients for further work-up and definitive surgery. In addition to being acceptable and accurate, it can greatly reduce the demand for hysteroscopy. In view of high accuracy of Saline infusion sonohysterography, it can be recommended, along with endometrial biopsy as the standard procedure for the evaluation of women with postmenopausal bleeding.²¹ MRI is superior in assessment of the septal thickness and depth, prior to surgery. Also, MRI is useful in identification of the cervix which is crucial for differentiating a high transverse vaginal septum from congenital absence of the cervix. MRI also helps in easily identifying associated additional anomalies and is critical in helping delineate complex anomalies with marked secondary distortion of the uterovaginal anatomy.¹⁶ The clinical characteristics, imaging features and management of vaginal septum anomalies are summarized in (Tab. 2).¹⁹

The MRI can show a hypointense concentric thickening of the vaginal wall on T2 weighted images. The use of gel allows better evaluation of pseudo-stenosis. The use of intravaginal gel also increases the sensitivity of MRI without gel in detecting DIE (deeply infiltrating endometriosis) lesions. Diagnostic difficulties of DIE are related to the inherent features of endometriotic lesions which can have an MRI signal intensity very similar to those of the surrounding fibromuscular anatomic structures. In this regard the advantage of the gel is its hyperintense signal on T2 weighted image which contrasts the hypointense signal of the surrounding fibromuscular anatomical structures, therefore facilitating the diagnosis. The intravaginal gel relaxing the vaginal wall and the fornices also allows a better view of the anterior deep pelvic area and of the retrocervical area. The thin line of the posterior vaginal wall, hyperintense on T1

weighted fat saturation sequences, indicating blood plaques, was detected only after vaginal distension. An MRI with endovaginal gel allows essential preoperative mapping for the surgical removal of the DIE lesions. Furthermore, this method stands out because of higher sensitivity compared to transvaginal ultrasonography and MRI without gel, detecting more lesions.¹⁷

Higher subsequent pregnancy success rate has been reported with repair of a vaginal obstruction. Pregnancy success rate is increased in patients with a complete transverse vaginal septum of the lower third of the vagina as compared with those with a higher septum. This is since in patients with a higher vaginal septum, retrograde menstruation occurs early after the onset of menstruation as only a small portion of vagina is present that predisposes these patients to the development of endometriosis leading to infertility in these cases. Thus, prompt diagnosis and surgical correction to drain accumulated blood may preserve reproductive capacity by preventing this sequela.¹⁸

Distention of the vagina can also often aid diagnosis and staging of pelvic cancers. MRI is often used for surveillance after treatment of patients with gynecologic malignancies. After hysterectomy, the vagina is typically well delineated when gel is used. Vaginal distention improves detection of recurrence and its relationship with the vaginal cuff, and the use of gel can increase confidence in excluding recurrence. Thus administration of vaginal gel before pelvic MRI is inexpensive, well tolerated, and can improve the diagnostic usefulness of MRI for a number of benign and malignant gynecologic conditions.

Conclusion

The MR imaging gel instillation technique shown by our single center study is considered to be a useful, beneficial and minimally invasive approach for diagnosing obstructed and non-obstructed vaginal septum. We also believe that this method will be recognized as a superior diagnostic approach in patients suffering from vaginal endometriosis and thus help the gynecologists in planning effective therapeutic strategies.

Conflict of Interest: None

References

1. Humphries PD, Simpson JC, Creighton SM, Hall Craggs MA. MRI in the assessment of congenital vaginal anomalies. *Clin Radiol* 2008; **63**: 442-8.
2. Brown MA, Mattrey RF, Stamato S, Sirlin CB. MRI of the female pelvis using vaginal gel. *Am J Roentgen* 2005; **185**: 1221-7.
3. Takeuchi H, Kuwatsuru R, Kitade M, et al. A novel technique using magnetic resonance imaging jelly for evaluation of rectovaginal endometriosis. *Fertil Steril* 2005; **83**: 442-7.
4. Ferreira DM, Bezerra ROF, Ortega CD, Blasbalg R, Viana PCC, Menezes MR, Rocha MS. Magnetic resonance imaging of the vagina: an overview for radiologists with emphasis on clinical decision making. *Radiol Bras*. 2015 Jul/Ago; **48(4)**: 249-59.
5. Sala E, Wakely S, Senior E, Lomas D. MRI of malignant neoplasms of the uterine corpus and cervix. *AJR Am J Roentgenol*. 2007; **188(6)**: 1577-87.
6. Balleyguier C, Sala E, Da Cunha T, et al. Staging of uterine cervical cancer with MRI: guidelines of the European Society of Urogenital Radiology. *Eur Radiol*. 2011; **21(5)**: 1102-10.
7. Bhosale P, Peungjesada S, Devine C, Balachandran A, Iyer R. Role of magnetic resonance imaging as an adjunct to clinical staging in cervical carcinoma. *J Comput Assist Tomogr*. 2010; **34(6)**: 855-64.
8. P. Loubeyre, P. Petignat, S. Jacob, J. Egger, J. Dubuisson, and J. Wenger, "Anatomic distribution of posterior deeply infiltrating endometriosis on MRI after vaginal and rectal gel opacification," *American Journal of Roentgenology* 2009; **192(6)**: 1625-31
9. S. C. Ribeiro, R. A. Tormena, T. V. Peterson et al., "Mullerian duct anomalies: review of current management," *Sao Paulo Medical Journal* 2009; **127(2)**: 92-6.

10. A. H. Heger, L. Ticson, L. Guerra et al., "Appearance of the genitalia in girls selected for non abuse: review of hymenal morphology and nonspecific findings," *Journal of Pediatric & Adolescent Gynecology* 2002; **15(1)**: 27-35.
11. Opoku BK, Djokoto R, Owusu-Bempah A, Amo-Antwi K. Huge abdominal mass secondary to transverse vaginal septum and cervical dysgenesis. *Ghana Med J*. 2011; **45**: 174-6.
12. Propst AM, Hill JA 3rd. Anatomic factors associated with recurrent pregnancy loss. *Semin Reprod Med* 2000; **18(4)**: 341-50.
13. Laufer MR, Goldstein DP, Hendren WH. Structural abnormalities of the female reproductive tract. In: Emans SJ, Laufer MR, Goldstein DP, eds. *Pediatric and adolescent gynecology*. 5th ed. Boston, Mass: Lippincott Williams & Wilkins, 2005; 362-416.
14. Lopez C, Balogun M, Ganesan R, Olliff JF. MRI of vaginal conditions. *Clin Radiol* 2005; **60(6)**: 648-62.
15. Haddad B, Louis-Sylvestre C, Poitout P, Paniel BJ. Longitudinal vaginal septum: a retrospective study of 202 cases. *Eur J Obstet Gynecol Reprod Biol* 1997; **74(2)**: 197-9.
16. Troiano RN, McCarthy SM. Mullerian Duct Anomalies: Imaging and Clinical Issues. *Radiology*. 2004; **233(1)**: 19-34.
17. Fiaschetti V, Crusco S, Meschini A, et al. Deeply infiltrating endometriosis: Evaluation of retrocervical space on MRI after vaginal opacification. *Eur J Radiol Nov* 2012; **81(11)**: 3638-45.
18. Rock JA, Zacur HA, Dlugi AM. Pregnancy success following surgical correction of imperforate hymen and complete transverse vaginal septum. *Obstet Gynecol*. 1982; **59(4)**: 448-53.
19. Junqueira B, Allen L, Spitzer R, Lucco K, Babyn P, Doria A. Müllerian Duct Anomalies and Mimics in Children and Adolescents: Correlative Intraoperative Assessment with Clinical Imaging. *Radio Graphics*. 2009; **29(4)**: 1085-103.
20. Comparison of Transvaginal Sonography, Saline Infusion Sonography, and Hysteroscopy in Premenopausal Women with Abnormal Uterine Bleeding. *Journal of Diagnostic Medical Sonography*. 2000; **16(4)**: 172-9.
21. Acceptability and Accuracy of Saline Infusion Sonohysterography in Women with Postmenopausal Bleeding. *Journal of the College of Physicians and Surgeons Pakistan* 2010; **20(9)**: 571-75