Mayer-Rokitansky-Kuster-Hauser Syndrome - A Detailed Study of Nine Cases

Amulya Reddy Bellal[1], Puneet Shirbur[2], Geetha R.G.[3]

[1, 2, 3] Department of Radio Diagnosis, MVJ Medical College and Research Hospital, Hoskote, Karnataka, India.

ABSTRACT

BACKGROUND

Mayer-Rokitansky-Küster-Hauser Syndrome or MRKH Syndrome is a rare condition and is the second most common cause of primary amenorrhea, comprising of vaginal atresia (upper two thirds), rudimentary uterus, normal fallopian tubes, ovaries, broad and round ligaments. The spectrum of uterine anomalies (hypoplasia or duplication) include a partial lumen to a bicornuate or septate uterus with obstruction (unilateral or bilateral). The incidence is 1 in 4500 - 5000 female live births, presenting with primary amenorrhoea. The secondary sexual characteristics, external genitalia, ovaries and karyotype are normal. There are two types - the first type is the isolated form and the second type also termed as MURCS association [Müllerian duct aplasia, renal dysplasia-agenesis, hydronephrosis, horseshoe kidney and cervicothoracic anomalies such as fused vertebrae, scoliosis etc.]. Initial assessment with ultrasound scan of abdomen and pelvis followed by MRI study of the abdomen and pelvis are the imaging modalities of choice.

METHODS

This is a case series of 9 female patients who had presented to the Department of Obstetrics & Gynaecology and the Department of Radiodiagnosis from July 2019 to June 2020, aged between 15 and 20 years with a chief complaint of anxiety due to primary amenorrhoea. Following a thorough clinical, gynaecological and biochemical evaluation (levels of FSH, LH and 17 beta oestradiol), radiological examination (ultrasound and MRI - abdomen and pelvis) was conducted.

RESULTS

In our study, out of a total of nine cases, six cases were MRKH Type I and three were MRKH Type 2. All the nine cases presented with primary amenorrhoea, normal secondary sexual characteristics (except one case with ectopic atrophic ovaries) and normal external genitalia. Available hormonal profile was unremarkable. Uterus was not palpable on PV and per speculum examination. Along with the above features, when features of only hypoplastic / infantile / rudimentary / absent uterus with hypoplastic / absent upper two thirds of vagina, normal pelvic ovaries or ectopic inguinal ovaries was present, a diagnosis of MRKH Type–I was given. With additional features of renal abnormalities or skeletal system abnormalities, a diagnosis of MRKH Type–II was given.

CONCLUSIONS

MRKH syndrome is a condition caused due to the failure of fusion of Müllerian duct derivatives. It affects 1 in 4500 - 5000 female live births. It is a class I Mullerian duct anomaly including vaginal atresia, uterine anomalies & malformations of the upper urinary tract. There are two types in this. USG and MRI of the abdomen and pelvis are helpful in imaging this condition.

KEYWORDS

MRKH Syndrome, Ultrasound, MRI, MURCS Association

Corresponding Author:
Dr. Amulya Reddy Bellal,
Flat No – 805 - S, Sunshine Block,
Sauparnika Purple Rose, Hoskote,
Chintamani Road – 562114, Karnataka, India.
E-mail: amu.reddy99@gmail.com

DOI: 10.18410/jebmh/2020/513

How to Cite This Article:
Bellal AR, Shirbur P, Geetha RG. Mayer-rokitansky - kuster - hauser syndrome - a detailed study of nine cases. J Evid Based Med Healthc 2020; 7(43), 2479-2484. DOI: 10.18410/jebmh/2020/513

Submission 11-08-2020,
Peer Review 18-08-2020,
Acceptance 24-09-2020,
Published 26-10-2020.

BACKGROUND

Reports of Mayer-Rokitansky-Küster-Hauser Syndrome or MRKH Syndrome goes back to the Hippocrates era. The medical term is named after the people who described it namely August Franz Josef Karl Mayer (1787 - 1865), Carl Freiherr von Rokitansky (1804 - 1878), Herman Küster (1879 - 1964) and George Hauser (1921 - 2009). Mayer–Rokitansky had described a syndrome that included uterine agenesis and vaginal agenesis, while Küster had observed a correlation with several urological defects. For this reason, this condition is also known as MRKH Syndrome.

There are other names described for this condition such as Rokitansky-Küster-Hauser Syndrome (RKHS), vaginal agenesis or Müllerian aplasia. This is a congenital abnormality where in there is a failure of normal development of the Müllerian duct from which develop the fallopian tubes, uterus, cervix and the upper two thirds of the vagina. Hence, this condition is characterised by the absence or hypoplasia of the uterus, cervix and upper two thirds of the vagina, consequently presenting with a chief complaint of primary amenorrhoea. Since the ovaries do not originate from the Müllerian ducts, the affected females may have normal secondary sexual characteristics. However, it is known that the lower 1 / 3rd of the vagina does not develop from the Müllerian ducts, it develops from the urogenital sinus (along with urinary bladder and the urethra), thus, accounting for the normal presence of the lower 1 / 3rd of the vagina. Since these women lack a uterus or have a hypoplastic / rudimentary uterus, they present with infertility. Additionally, these women may present with renal and cervicothoracic anomalies.

A thorough, clinical, gynaecological, biochemical and radiological evaluation via Ultrasound and MRI study of the abdomen and pelvis are needed in making a diagnosis of this condition.

Here, we report nine cases of MRKH syndrome, six cases of MRKH Type I and three of MRKH Type 2.

We wanted to study the MRI and ultrasound imaging findings in women with MRKH Syndrome.

METHODS

This is a case series of 9 female patients who had presented to the Department of Obstetrics & Gynaecology and the Department of Radiodiagnosis from July 2019 to June 2020. The patients were aged between 15 to 20 years and presented with a chief complaint of anxiety due to primary amenorrhoea and concern regarding their reproductive life. A thorough clinical, gynaecological and biochemical evaluation (levels of FSH, LH and 17 Beta oestradiol) was done. Following obtaining an informed consent either from the patient / parent / guardian, radiological examination which included Ultrasound study of the abdomen and pelvis using GE Voluson E6 machine (C1 - 5) and MRI abdomen and pelvis using Siemens Magnetom 1.5T machine was conducted. T2-weighted imaging in three planes, transverse T1-weighted imaging, STIR imaging and T1–post contrast imaging was done. Diagnosis of MRKH syndrome was made on the basis of presence of hypoplastic / infantile / rudimentary / absent uterus with hypoplastic / absent upper two thirds of vagina, normal orthotopic ovaries (seen in eight of the cases) or ectopic inguinal atrophic ovaries and additional extra uterine features involving the urinary or skeletal system. Further when imaging features of only hypoplastic / infantile / rudimentary / absent uterus with hypoplastic / absent upper two thirds of vagina, normal pelvic ovaries or ectopic inguinal ovaries (seen in one case) was present a diagnosis of MRKH Type–I was given. When there were additional features of renal abnormalities or skeletal system abnormalities, a diagnosis of MRKH Type–II was given.

Inclusion Criteria

- Both in-patients and out-patients were included in the study.
- Patients included were those presenting with a chief complaint of primary amenorrhoea and concern regarding their reproductive life.
- A thorough clinical and gynaecological examination revealing a non-palpable uterus on per vaginal and per speculum examination were included in view of clinical suspicion of uterine anomalies.

RESULTS

In our study, out of the total of nine cases, six cases were MRKH Type I and three were MRKH Type 2 cases. The patients age ranged from 15 to 20 years. All of the nine cases had presented with primary amenorrhoea, normal external genitalia and normal secondary sexual characteristics (in all except for one case that presented with a delay in the secondary sexual characteristics). Available hormonal profiles were unremarkable. Uterus was not palpable in all the nine cases on PV and per speculum examination. Along with the above-mentioned features, when features of only hypoplastic / infantile / rudimentary / absent uterus with Hypoplastic / absent upper two thirds of vagina, normal orthotopic ovaries (seen in eight of the cases) or ectopic inguinal atrophic ovaries (seen in 1 case) was present a diagnosis of MRKH Type–I was given. When there were additional features involving the urinary or skeletal system, a diagnosis of MRKH Type–II was given.

Case 1

A 20-years-old nulliparous woman came with a complaint of primary amenorrhoea and cyclical abdominal pain (since 3 months), there was a delay in the development of secondary sexual characteristics. On gynaecological examination, external female genitalia were noted. Uterus could not be felt in per vaginal and per speculum examinations. Hormonal study revealed reduced levels of estradiol. MRI study of the pelvis was suggested. MRI study of the pelvis revealed non visualization of the uterus and upper two-third of the vagina,

which was replaced by a fibrous cord like structure measuring 2 cm in diameter. This cord like structure was seen posterior to the urinary bladder. Also seen was a tubular structure measuring 2 cm in length and 1.3 cm in width at the inferior aspect of this fibrous cord which represented the Hypoplastic lower one-third of the vagina. There were also two, oval shaped, well defined structures, medial to the external iliac vessels, in the inguinal region bilaterally; measuring 6 x 10 mm in size on the left and 6 x 9 mm in size on the right side likely representing atrophic ectopic inguinal ovaries. Kidneys and urinary bladder appeared normal. Based on clinical features, radiological and gynaecological examinations, our first case was diagnosed as MRKH syndrome Type 1.

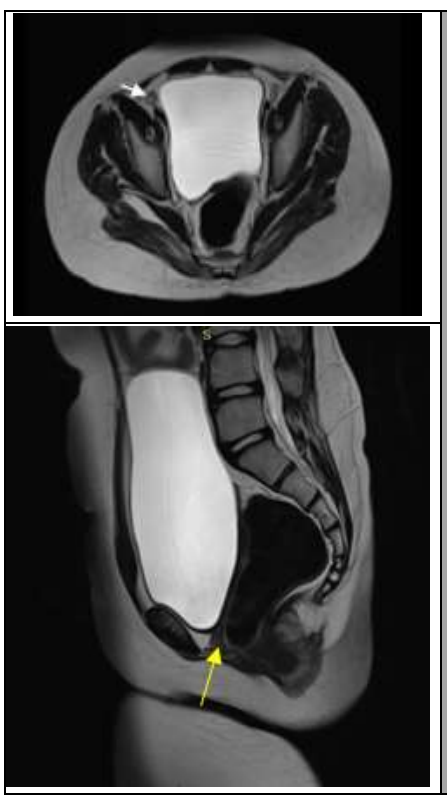
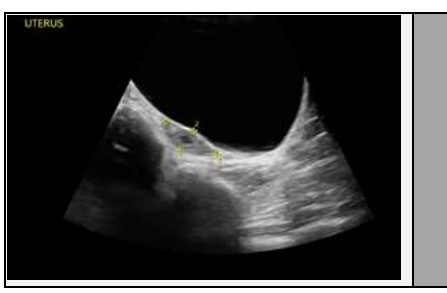


Figure 1. MRI Abdomen and Pelvis: a) Axial and b) Sagittal Images Showing Non-Visualization of the Uterus and Upper Two-Thirds of the Vagina Replaced by Cord like Structure (Yellow Arrow) and Hypoplastic Lower One-Third of the Vagina and Atrophic Ectopic Inguinal Ovaries (White Arrow)

Case 2

A 17-year-old female presented with primary amenorrhoea and pelvic pain since 2 months. Examination revealed normal development of secondary sexual characteristic with normal external female genitalia. Uterus was not palpable on per vaginal and per speculum examinations.



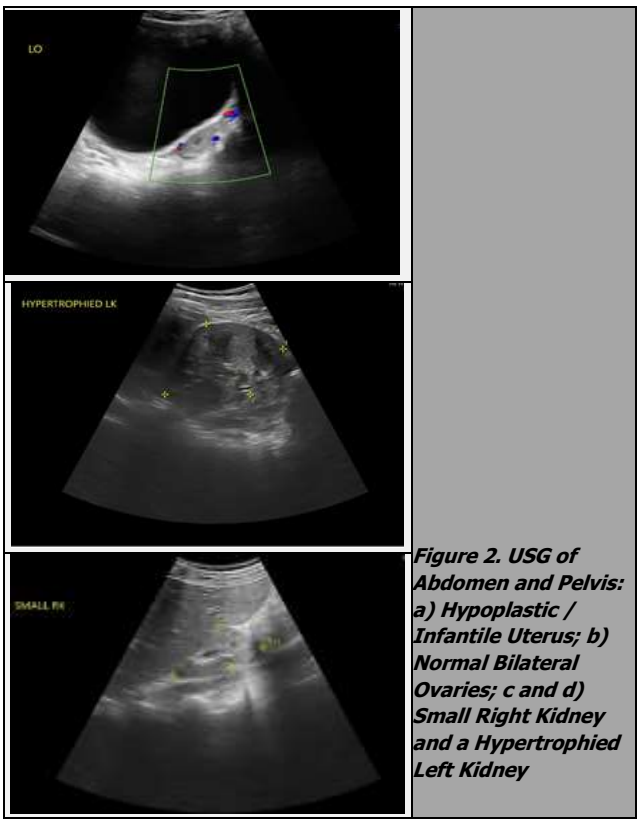
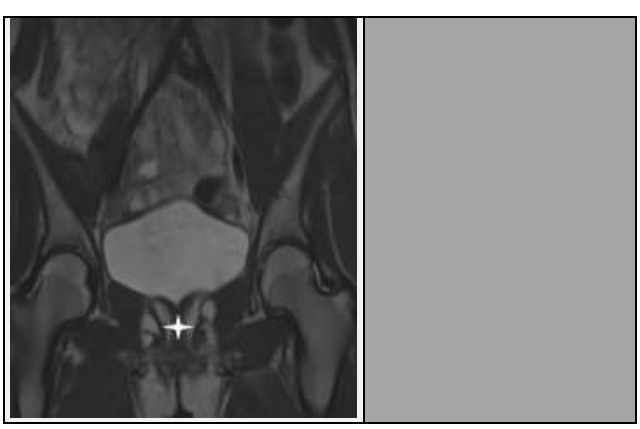


Figure 2. USG of Abdomen and Pelvis: a) Hypoplastic / Infantile Uterus; b) Normal Bilateral Ovaries; c and d) Small Right Kidney and a Hypertrophied Left Kidney

The hormonal profile was normal. Scoliotic spine deformity was noted. Ultrasound of the abdomen & pelvis and MRI of the abdomen & pelvis was suggested.

On Ultrasound of the abdomen and pelvis a hypoplastic / infantile uterus measuring 3.8 x 1.4 x 2.6 cm in size was noted. However, bilateral ovaries were normal in appearance and size. There was a small right kidney measuring 6.7 x 2.0 cm in size and a hypertrophied left kidney measuring 12 x 6.5 cm in size. On MRI study of the abdomen and pelvis a Hypoplastic / infantile uterus measuring 4.0 x 1.6 x 2.5 cm in size was noted with a bicornuate uterine morphology. Hypertrophied left kidney and a small right kidney was also noted along with scoliotic spine deformity and butterfly vertebra. Based on clinical features, radiological, biochemical, and gynaecological examinations, the second case was diagnosed as MRKH syndrome Type 2.



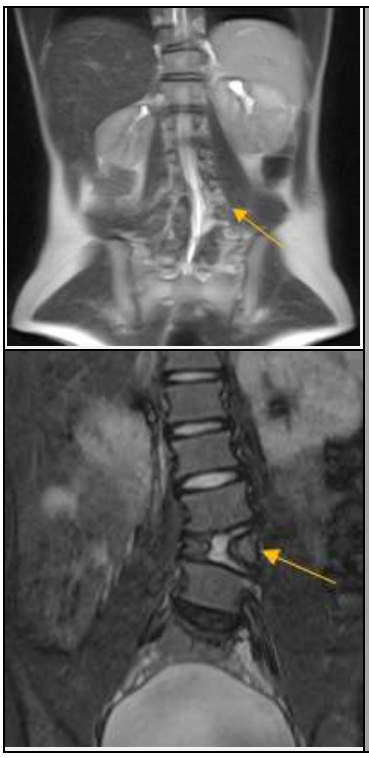


Figure 3. MRI Abdomen and Pelvis: T2WI: (a) Hypoplastic / Infantile and Bicornuate Uterus (White Asterix), (b) Scoliotic Spine Deformity (Yellow Arrow); (c) Butterfly Vertebra (Yellow Arrow)

Case 3

A 20-year-old female presented with primary amenorrhea. On examination, the secondary sexual characteristics were normal. Pelvic examination showed normal external genitalia. Hormonal profile was unremarkable. Ultrasound and MRI study of the abdomen and pelvis was done. On Ultrasound and MRI study of the abdomen and pelvis the uterus and upper two-thirds of the vagina were grossly hypoplastic with the remnant uterine tissue measuring about 1.9 x 1.0 x 3.6 cm in size. Lower one-third of the vagina was normal. Bilateral ovaries were visualized at orthotopic location and demonstrated multiple follicles within. Bilateral kidneys and urinary bladder were unremarkable. Based on clinical features, radiological, biochemical, and gynaecological examinations, the third case was diagnosed as MRKH syndrome Type 1.

Figure 4. MRI Abdomen and Pelvis: a) T2W Axial; b) T2W Coronal (Asterix); c) T2W Sagittal Images (Arrow) Revealing Grossly Hypoplastic Uterus and Upper Two-Thirds of the Vagina

Case No.	Age & Chief Complaint	Examination Findings	Imaging Findings	Final Diagnosis
4.	18 Years; chief complaint of primary amenorrhoea and pelvic pain since 1 week	Normal development of secondary sexual characteristics; thelarche and pubarche at 11 Years of age; external female genitalia –present; uterus not palpable on per speculum and per vaginal examination and unremarkable hormonal profile	MRI-PELVIS: Rudimentary uterus with absence of upper two thirds of vagina. Bilateral ovaries seen in the pelvic cavity	MRKH Type-I
5.	17 Years; chief complaint of primary amenorrhoea	Normally developed secondary sexual characteristics; thelarche and pubarche at age 12 Years with normal external female genital; Non palpable uterus on PV examination	USG and MRI PELVIS: Hypoplastic uterus and absent upper two thirds of vagina. Bilateral ovaries seen in the pelvic cavity	MRKH Type-I
6.	20 Years; chief complaint of primary amenorrhoea	Normal development of secondary sexual characteristics and external genitalia with a normal hormonal profile. On PV examination uterus was not palpable.	USG and MRI PELVIS: Infantile uterus with bilateral ovaries seen in the pelvic cavity. Hypoplastic upper two thirds of vagina	MRKH Type-I
7.	18 Years; chief complaint of intermittent pain abdomen since 1 month and primary amenorrhoea	Normal presence of pubic and axillary hair with normal breast development and hormonal profile. External genitalia were normal. On PV examination-non palpable uterus	USG and MRI PELVIS: Hypoplastic uterus and upper two thirds of vagina. Pelvic location of bilateral ovaries	MRKH Type-I
8.	20 Years; chief complaint of primary amenorrhoea	Normal development of secondary sexual characteristics and external genitalia; non palpable uterus on PV examination	USG and MRI PELVIS: Hypoplastic infantile uterus and hypoplastic upper two thirds of vagina. Bilateral ovaries are pelvic in location. Block vertebra and bifid spinous process	MRKH Type-II
9.	19 Years; chief complaint of primary amenorrhoea and cyclical pelvic pain since 3 months	Normal presence of pubic and axillary hair with normal breast development. Uterus was not palpable on PV and PS examination	USG and MRI PELVIS: Hypoplastic uterus and upper two thirds of vagina. Bilateral pelvic ovaries. Hypoplastic left kidney and lumbarization of S1	MRKH Type-II

Table 1. Details of the Other Six Cases of Mayer-Rokitansky-Kuster-Hauser Syndrome

Primary Amenorrhoea	Seen in all 9 Cases
External Genitalia	Were normal in all the 9 cases
Secondary sexual characteristics	Normal development was seen in 8 cases and delayed development was noted in one case (with bilateral ectopic ovaries)
Per vaginal / per speculum examination	Revealed a non-palpable uterus in all the 9 cases
Hormonal profile	Were normal in 8 cases and was altered in 1 case that had bilateral ectopic ovaries

Table 2. Representing the Various Clinical, Gynaecological, and Biochemical Findings of the 9 Cases

Uterus	
• Non visualisation of the uterus	• Was seen in 1 case
• Infantile / Hypoplastic / Rudimentary	• Was seen in 8 cases; with one of the cases showing a bicornuate uterine morphology
Vagina	
• Non visualisation of upper two-third of vagina	• Was seen in 3 cases with one of the cases also showing a Hypoplastic lower one-third of vagina
• Hypoplastic upper two-third of vagina	• Was seen in 6 cases
Ovaries	
• Orthotopic	• Was seen in 8 cases
• Ectopic	• Was seen in 1 case
Extra-Uterine Features	
• Skeletal manifestations	• Was seen in 3 cases; the findings included butterfly vertebra, scoliotic spine deformity, block vertebra, bifid spinous process and lumbarisation of S1
• Renal manifestations	• Was seen in 3 cases and included hypertrophies / Hypoplastic kidneys

Table 3. Various MRI Features Noted

DISCUSSION

Mayer-Rokitansky-Küster-Hauser Syndrome is a rare condition and is the second most common cause of primary amenorrhea, comprising of atresia of the upper two thirds of the vagina, rudimentary uterus, normal fallopian tubes, ovaries, broad and round ligaments. The spectrum of uterine anomalies (hypoplasia or duplication) include a partial lumen to a bicornuate or septate uterus with obstruction (unilateral or bilateral).[1]

MRKH syndrome patients have pubarche and thelarche that are appropriately timed and a normal female karyotype of 46, XX, that differentiates this syndrome from other development defects of the genital tract like Turner syndrome (45 X 0) and androgen insensitivity syndrome (46 XY).[2]

The incidence is about 1 in 4500 - 5000 live female births. A failure normal fusion of Müllerian duct derivatives between gestational weeks 3 through 12 results in the associated malformation of the uterus and upper two thirds of the vagina.[3] It belongs to class I Mullerian duct anomalies.[4] MRKH syndrome has two types: type I is the isolated type and type II also called as MURCS association (Müllerian duct aplasia, Renal dysplasia–agenesis, hydronephrosis, horseshoe kidney and cervicothoracic anomalies (asymmetric, fused vertebrae, scoliosis and Klippel-Feil anomaly).

The associated malformations are:

- Skeletal and vertebral malformations (Klippel-Feil syndrome; fused vertebrae, scoliosis).
- Renal abnormalities (unilateral renal agenesis, ectopic kidneys or horseshoe shaped kidney).
- Other rare anomalies range from cardiac to digital anomalies (example: polydactyly).

Upper urinary tract malformations are seen in about 30 – 40 %[5] including unilateral renal agenesis (25 % - 30 %), ectopic kidneys (pelvic) (20 %), hypoplastic kidneys (5 %), horseshoe shaped kidney and hydronephrotic kidneys. Skeletal abnormalities are seen in about 10 – 15 % of the cases, while auditory defects are also seen, though rarely.[6,7] MRKH syndrome was initially described by Mayer in the year 1829. Initially the description consisted of various anomalies of the vagina such as duplications. Later in the year 1838, Rokitansky described uterine and vaginal agenesis in this syndrome. Küster described renal abnormalities and skeletal abnormalities in 1910. Other rare associations include cardiac anomalies and anorectal malformations (ARM).

The diagnosis is often made clinically, however, confirmation either radiologically or laparoscopically is required in patients with normal hormonal and karyotypic investigations. Two-dimensional ultrasound is the initial imaging modality choice, with three-dimensional ultrasound being more sensitive. When ultrasound is equivocal computed tomography (CT) can identify the congenital anomalies, but is not performed routinely due to radiation exposure. MRI is more effective due to the multiplanar capability and the excellent inherent soft tissue contrast.[8]

The clinical findings of MRKH syndrome are characteristic and a diagnosis can be easily made clinically. But, the diagnosis confirmation, evaluation for other anomalies and for ruling out coexistent Turner's syndrome further investigations such as laparoscopy, radiological imaging and karyotyping is needed. In a classic case of MRKH syndrome, the clinical diagnosis and surgical planning are relatively simple. However, in the remaining of the patients with a blind upper one third of the vagina evaluation by laparoscopy or USG (2D or 3D) cannot be made clearly. For evaluation of the upper renal tract anomalies seen in approximately 40 % of the cases an ultrasound will be useful; However, an MRI is the imaging modality of choice in a case of MRKH syndrome.

In MRKH Syndrome a young woman presents with primary amenorrhoea but otherwise has normal secondary sexual characteristics, external genitalia, ovaries and karyotype. In our study, out of the total nine cases; six cases were MRKH Type I and three were MRKH Type 2 cases. All of the nine cases presented with primary amenorrhoea, and normal external genitalia. Normal secondary sexual characteristics were seen in all except for one case with atrophic ectopic ovaries where there was a delay in the development of secondary sexual characteristics. Available hormonal profiles (five of the nine cases) were unremarkable. Uterus was not palpable in these cases on PV and per speculum examination. Along with the above-mentioned features, when features of only hypoplastic / infantile / rudimentary uterus with hypoplastic upper two thirds of vagina, normal pelvic ovaries or ectopic inguinal ovaries (seen in 1 case) was present a diagnosis of MRKH Type-I was given. When there were additional features

involving the urinary or skeletal system, a diagnosis of MRKH Type-II was given.

Management and Treatment

In women with MRKH syndrome counselling is required for her and her family to deal with the anxiety and psychological stress due to the condition. Other treatment options available are creating a neo-cavity surgically or non-surgically (by using vaginal dilators) and vaginal replacement.

CONCLUSIONS

MRKH syndrome, occurs due to failure of fusion of Müllerian duct derivatives and affects 1 in 4500 to 5000 female live births. It is a class I Mullerian duct anomaly and includes vaginal atresia, uterine anomalies and malformations of the upper urinary tract. USG and MRI of the abdomen and pelvis are helpful in imaging this condition.

Data sharing statement provided by the authors is available with the full text of this article at jebmh.com.
Financial or other competing interests: None.
Disclosure forms provided by the authors are available with the full text of this article at jebmh.com.

REFERENCES

[1] Rumack CM. Diagnostic ultrasound. Pediatric pelvic sonography. Vol. 1. 4th edn. 2011: p. 1925-1981.
[2] Sen KK, Kapoor A. Mayer-Rokitansky-Kuster-Hauser syndrome. Ind J Radiol Imag 2006;16(4):805-807.
[3] Zaidi MS, Hassan A, Almogbel E. MRKH Syndrome in a young woman. AACE Clinical Case Reports 2017;3(2):e93-e95.
[4] Andreas A. Granger and Allison's diagnostic radiology. Imaging of the kidney, urinary tract and pelvis in children. Vol. 1. 6th edn. Elsevier Health Sciences 2014: p. 1848-1890.
[5] Morcel K, Camborieux L, et al. Mayer-Rokitansky-Kuster- Hauser (MRKH) syndrome. Orphanet J Rare Dis 2007;2:13.
[6] Gupta NP, Ansari MS. Mayer-Rokitansky-Kuster-Hauser (MRKH) syndrome - a review. Indian J Urol 2002;18(2):111-116.
[7] Pittock ST, Babovic-Vuksanovic D, Lteif A. Mayer-Rokitansky-Kuster-Hauser anomaly and its associated malformations. Am J Med Genet A 2005;135(3):314-316.
[8] Siegel MJ. Pediatric applications. In: Lee JK, edr. Computed body tomography with MRI correlation. 3rd edn. Lippincott-Raven 1998: p. 1548.