The Egyptian Journal of Radiology and Nuclear Medicine xxx (2017) xxx–xxx

Contents lists available at ScienceDirect

The Egyptian Journal of Radiology and Nuclear Medicine

journal homepage: www.sciencedirect.com/locate/ejrnm

Original Article

MR imaging evaluation of obstructing vaginal malformations with hematocolpos or hematometra in adolescent girls: A cross sectional study

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ARTICLE INFO

Article history:
Received 2 December 2016
Accepted 29 April 2017
Available online xxxx

Keywords:
Herlyn Werner Wunderlich syndrome (HWWS)
Mullerian duct anomaly
Magnetic Resonance Imaging (MRI)
Hymenectomy
Vaginal septum

ABSTRACT

Objective: Vaginal or uterine outlet obstruction leads to hematocolpos or hematometra. Detection of the etiology of this entity is important to guide adequate surgical management and thereby avoid complications and to preserve fertility. The aim of this study was to evaluate obstructing vaginal malformations in adolescent girls presenting with hematocolpos or hematometra with MR imaging.

Materials and methods: A hospital based prospective study was conducted in a tertiary care centre from September 2015 to October 2016. The study included 17 adolescent females who were evaluated with MRI.

Result: Of 17 adolescent female with vaginal or uterine outflow obstructive anomalies with hematocolpos or hematometra, where 6 patients (35.3%) had HWWS, 6 patients (35.3%) had imperforate hymen, 2 patients (11.8%) had transverse vaginal septum, 1 patient each (5.9%) had cervico-vaginal atresia, unicornuate uterus and communicating rudimentary Uterine horn. MRI revealed hematocolpos in 15 patients (88.2%), hematometra in 13 patients (76.5%), endometriotic ovarian cysts in 6 patients (35.3%) and hematosalpnix in 3 patients (17.6%).

Conclusion: Early radiological diagnosis of the cause of vaginal or uterine outflow obstruction is important to guide adequate surgical management which if undertaken promptly helps to avoid complications due to reflux from vaginal or uterine outflow obstruction.

1. Introduction

Congenital vaginal or uterine outflow obstruction may occur at different levels with different clinical presentations [1]. In hematocolpos there is accumulation of menstrual blood in the vaginal cavity. Its occur due to obstruction in vaginal outflow tract. Vaginal outflow obstruction is commonly associated with imperforate hymen, transverse vaginal septum, vaginal atresia, hemi-vaginal atresia (Herlyn Werner Wunderlich syndrome), cervico-vaginal atresia, abnormal vaginal opening, cloacal malformation and acquired vaginal stenosis. Even though hematocolpos and hydrometrocolpos are rare anomalies of female genital tract, the incidence of these anomalies is reported between 3.8 and 0.1% [2].

Embryologically, the vagina develops from different sources. The upper 2/3rd of the vagina develops from the fused paramesonephric ducts and the lower 1/3rd from the urogenital sinus [3]. Due to different origins of vaginal portions, vaginal outflow obstruction clinically manifests as hydrometrocolpos in the neonatal period and hematometrocolpos at puberty.

Majority of patients with vaginal outflow obstruction may experience sexual difficulty, menstrual irregularities and infertility. Hematocolpos commonly associated with hematometra, hematosalpnix and haemorrhagic (endometriotic) cysts in ovaries [4] which occurs commonly in untreated patients of vaginal outflow

Peer review under responsibility of The Egyptian Society of Radiology and Nuclear Medicine.

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https://doi.org/10.1016/j.ejrnm.2017.04.010
0378-603X/

obstruction. Recurrent endometriosis occurs as a long standing complication of vaginal or uterine outflow obstruction, hence early diagnosis and management of these conditions is of atmost importance to avoid complications [4].

Imperforate hymen accounts for about 0.1% of hematocolpos cases at puberty [5,6]. Imperforate hymen may sometimes be diagnosed soon after birth but more commonly it is diagnosed in adolescence [7].

HWWS occurs due to defective development in lateral fusion or reabsorption failure of paired para-mesonephric ducts. It comprised of uterine didelphys, obstructed hemi-vagina and ipsilateral renal agenesis. The estimated incidence of HWWS is varies from 0.1% to 10% [8–10]

The prevalence of transverse vaginal septum had been reported as 1 in 30,000 to 1 in 84,000 females [11,12].

Uncommonly isolated vaginal atresia can cause of hematocolpos or hematometra with primary amenorrhea [13].

The aim of this study was to evaluate obstructing vaginal malformations in adolescent girls presenting with hematocolpos or hematometra with MR imaging.

2. Materials and methods

After approval from the institutional ethics review committee, a hospital based prospective study was conducted. The study group comprised of 17 adolescent girls presenting to the departments of Obstetrics & Gynaecology, Pediatric Surgery and Radiodiagnosis of a tertiary care centre from September 2015 to October 2016 (see Table 1).

2.1. Patient selection

We included adolescent girls with cyclical lower abdominal pain, lower abdominal lump and clinical or preliminary ultrasonographic suspicion of vaginal/uterine anomalies. Informed consent was obtained from patients/parents/guardian before undergoing MRI scan. Medical records of all patients were evaluated. Follow up were done in all 17 patients with Ultrasonography. Initial Ultrasonography (USG) were done using Aplio-500 Machine (Toshiba Medical Systems Corporation, made in Tokyo, Japan). MRI scan were done in Siemens Avanto 1.5 Tesla B15 machine (Siemens Medical Systems, Erlangen, Germany). The initial USG and MRI findings were correlated with Colposcopic examination and or surgical findings (see Table 2).

Table 1
Summarizes the clinical findings in 17 adolescent girls with hematocolpos or hematometra.

Serial no	Menarche/ age (y)	Presentation age (y)	Clinical presentation
1	No	13	Cyclical lower abdominal pain
2	No	14	Palpable hypogastric mass
3	No	11	Lower abdominal pain and dysuria
4	Yes/13	15	Urinary retention with abdominal pain
5	No	12	Palpable hypogastric lump, low backache
6	No	12	Palpable hypogastric lump
7	No	12	Cyclical lower abdominal pain
8	No	15	Cyclical lower abdominal pain
9	No	13	Cyclical lower abdominal pain
10	Yes/14	16	Cyclical lower abdominal pain
11	No	13	Cyclical lower abdominal pain, dysuria
12	No	14	Urinary retention with abdominal pain
13	No	15	Cyclical lower abdominal pain
14	No	14	Urinary retention with abdominal pain
15	Yes/14	15	Cyclical lower abdominal pain
16	No	15	Cyclical lower abdominal pain
17	No	16	Urinary retention with lower abdominal lump

2.2. MRI protocols

All patients were subjected to MRI scan of lower abdomen with phased- array surface coil. Initial fast spin echo sagittal T1WI and fat suppressed T2WI images of uterus was obtained to ascertain the uterine lie followed by fast spin echo T2WI and fat suppressed T2WI imaging planes to obtained true coronal images of uterus. Sagittal T1W images were obtained with TE:10–12 ms, TR: 500–600 ms, slice thickness 4 mm, flip angle 150° and FOV of 190–200. Sagittal T2WI images were obtained with TE: 90–105 ms, T R:4800–6000 ms, slice thickness 4 mm, flip angle 150^0 and FOV of 190–200. True coronal T2W images for uterus were obtained with TE: 90–105 ms, TR: 5000–6000 ms, 256 × 256 matrix, echo train length 13–14, slice thickness 4 mm with 1 mm interslice gap, flip angle of 150° and FOV of 240–260. Fat suppressed axial T2W images were obtained with TE:90–100 ms, TR: 4500–5500 ms, flip angle 150°, slice thickness of 1–2 mm with no interslice gap and FOV of 200–240. GRE (gradient recalled echo) images were obtained in axial planes with TE: 18–24 ms, TR: 600–660 ms, interslice gap of 1–2 mm, section thickness 3–4 mm, flip angle 28 and FOV of 200–240.

Diffusion weighted images (DWI) were obtained in axial plane using a multi-slice spin echo planer imaging sequence. Imaging parameters were TE: 80–90 ms, TR: 2800–3200 ms, interslice gap of 1–2 mm, section thickness 3–4 mm, flip angle 90°, FOV of 190–200. RF band width of 1390–1420 and matrix of 128 × 128. Diffusion probing gradients were applied in the three orthogonal directions with same strength. Diffusion weighted MR images were acquired with a diffusion weighted factor of 1000 s/mm^2.

Fast(Turbo) spin echo 3D imaging technique SPACE imaging were done in coronal plane. The imaging parameters were TE: 200–250 ms, TR: 1200–1400 ms, section thickness 0.8–1 mm, flip angle 150°, FOV of 200–240 and acquisition matrix of 300 × 300.

Finally fat suppressed coronal T2WI images of abdomen including the Kidneys were obtained using parameters; TE: 90–100 ms, TR: 4000–6000 ms, echo train length 27–29, slice thickness 4–6 mm, flip angle of 150^0 and FOV of 280–380.

2.3. Evaluation

Seventeen patients of hematocolpos and hematometra were examined to look for detail morphological anatomy of uterus, cervix and vagina and their anatomical variations, status of signal intensity of collection either in vaginal canal, endo-cervical canal, fallopian tubes or ovaries. Associated extra-uterine anomalies like renal anomaly or syndromic causes were also sought. Sagittal images provide uterine position or axis, any abnormal collections in endometrial, cervical or vaginal canal. Also helps in assessment of status of transverse vaginal septum or imperforate hymen in vaginal canal.

True coronal images provides of status of uterine cavity, cervical canal, vaginal canal and presence of any T2WI hypointense septa either in uterine cavity, cervix or vagina.

DWI helps in assessment of endometrial cavity, cervical canal, status of fallopian tubes and endometriotic ovarian cysts.

Fast(Turbo) spin echo 3D SPACE imaging with reconstruction in all three planes helps in better delineation of endometrial, cervical and vaginal canals and status of vaginal septum.