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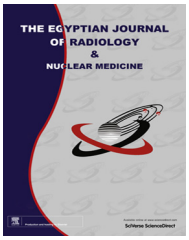

ORIGINAL ARTICLE

An integrated imaging approach for diagnosis of cervico-vaginal outflow defects and associated genital anomalies

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KEYWORDS

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Abstract *Objective:* The objective of this study was to evaluate the diagnosis of cervico-vaginal outflow anomalies using different ultrasound approaches (transabdominal, endoluminal and transperineal) and magnetic resonance imaging.

Subjects and methods: Thirty female patients, their age ranged from 11 to 42 years (mean age 14.4, +/6.9 s/d) with clinically suspected cervico-vaginal outflow defects presented with amenorrhea, dyspareunia or cyclic abdominal pain. They were subjected to ultrasound and MR imaging examinations. Imaging results were correlated with clinical examination and surgery.

Results: The study included 10/30 cases of aplasia/hypoplasia (33.3%), 4/30 cases of imperforate hymen (13.3%), 6/30 cases of transverse vaginal septum (20%), 4/30 cases of vaginal atresia (13.3%), 3/30 cases of combined cervical/vaginal atresia (10%), 1/30 case of cervical stenosis (3.3%), 1/30 case of cervical atresia (3.3%), and 1/30 case of vaginal atresia with fistula (urogenital sinus syndrome) (3.3%). Obstructed outflow was detected in 17 patients (56.6%). The accuracy of multi-approach US and MRI examinations in diagnosis of cervico-vaginal outflow anomalies was 94.1% and 97.1% respectively.

Conclusion: Ultrasound examination using different approaches remains the initial investigation for all patients with simple müllerian anomalies. MRI examination could be reserved for more complex anomalies, long cervicovaginal atresia and for cases of urogenital sinus syndrome.

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1. Introduction

The true incidence of müllerian anomalies, including obstructive subtypes, is believed to be between 0.1% and 3.8% (1). Multifactorial polygenic and familial factors are involved in their formation. The result may be deficient development, non-fusion, or defective canalization of the müllerian ducts (2).

The modified American Fertility Society (AFS) by Rock and Adam embraces a broader collection of uterine and vaginal anomalies. This classification correlates anatomic anomalies with embryologic arrests. Accordingly, uterovaginal anomalies are categorized as dysgenesis disorders or vertical or lateral fusion defects (3).

If isolated, these anomalies go unnoticed. However, many surface as a result of deviations in menses or sexual capacity. The diagnosis and treatment of urogenital anomalies is challenging and requires a comprehensive and through understanding of the condition, which may not be fully appreciated until surgical exploration is undertaken. Counseling and treatment of these conditions often requires a lifelong multisystem approach. Improved patient self-imaging, reproductive potential, and sexual satisfaction are the main goal of treatment (1).

Vaginal agenesis is characterized by an absence or hypoplasia of the uterus and proximal vagina. It occurs in an estimated 1 in 5000 newborn females (4). Vaginal atresia occurs when the urogenital sinus fails to contribute to the inferior portion of the vagina (5). The müllerian structures are usually normal, but fibrous tissue completely replaces the inferior segment of the vagina. Although not müllerian in origin, vaginal atresia can clinically mimic vaginal agenesis and imperforate hymen (6).

Transverse vaginal septum is one of the most rare müllerian duct anomalies, with approximate frequency of 1 case in 70,000 females (7,8). Transverse septa arise from an incompletely canalized vagina and urogenital sinus, and they may be complete or incomplete. 46% occurs in the upper vagina, 40% in the midvagina, and 14% in the lower vagina (9).

Failure of the lower müllerian ducts to fuse can result in a longitudinal septum that either partial or complete (10). If a double uterus (uterine Didelphis) exits, one uterine hemicorpus tends to be developed and may be a source of infertility or recurrent abortion. If a partial or fully obstructing septum exists, progressive dysmenorrhea or a pelvic mass may be the presenting factors (1).

Although of different embryological origin, the imperforate hymen is commonly listed with defects of the vertical fusion of the müllerian ducts. Imperforate hymen is the most common obstructive anomaly and has an incidence of 0.1% (1).

Cervical aplasia and dysgenesis are vertical fusion defects that involve complete or partial absence of the cervix and upper vagina. The true incidence of this condition is difficult to determine, but the frequency is reportedly 1 in 4500 live births. Anatomically, cervical anomalies may be subtyped: (1) fibrotic cervical banding with endocervical glands, (2) cervical fragmentation, (3) cervical os obliteration, and (4) mid-cervical (11). Because of hematometras, patients with cervical dysgenesis are prone to endometriosis and adhesions. Laparoscopic treatment may be less invasive than abdominal surgery, but ultimately vaginal canalization with hysterectomy is required to treat this condition (12).

Ultrasound (US) is recommended as the first line imaging modality. Limitation of pelvic US includes operator dependence and patient obesity (10). Magnetic resonance (MR) imaging is a useful noninvasive tool for demonstrating pelvic anatomy and abnormalities, including anomalies of female genital system (13–15). With development of new software and improved hardware, MR imaging has proved to be helpful tool in the management of uterovaginal anomalies, particularly complex lesions (16).

The purpose of the study was to evaluate the diagnostic accuracy of ultrasound using different approaches (transabdominal, endoluminal and transperineal) compared to magnetic resonance imaging in patients with clinically suspected cervico-vaginal outflow anomalies and also to determine the cause, the level of canalization defect and associated genital anomalies in order to guide for proper surgical management.

2. Patients and methods

Thirty patients with clinically suspected cervico-vaginal outflow defects presenting with amenorrhea, dysparunia or cyclic abdominal pain were referred to the Women's Imaging Unit in Radiology department from the Obstetrics and Gynecology Department, Cairo University. Their age ranged from 11 to 42 years (mean 14.4).

Ultrasound and pelvic MRI examinations were performed for all patients.

2.1. Ultrasound examination

Ultrasound examination was performed through different approaches:

(1) Transabdominal scan using a 3.5–5 MHz sector transducer was performed for all patients after adequate bladder distention.
(2) Endoluminal; transvaginal (TVS) (in married individuals, $n = 4$) or transrectal (TRUS) approach ($n = 8$) was performed using 7–8 MHz endoluminal transducer.
(3) Transperineal approach using 7–8 MHz endoluminal transvaginal probe was performed for all patients.

2.2. Magnetic resonance imaging

Pelvic MRI was performed for all cases. All the patients were imaged in the supine position using pelvic phased-array coil. Cases were examined by T2-weighted pulse sequences FSE (TR/TE 1600/100 ms) in the axial, sagittal and coronal planes, and matrix 256×192; Axial T1-weighted sequence SE (TR/TE 500/40 ms); Slice thickness 4 mm with 1 mm gap. Instilling of endovaginal aqueous gel prior to imaging was performed in one patient for better delineation of vaginal anatomy.

2.3. Image analysis

Ultrasound through different pelvic approaches and MR pelvic images were reviewed to assess cervicovaginal outflow regarding genesis, canalization, obstruction, co-existence of other müllerian duct anomalies or associated pelvic lesions.

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