

# Unilateral renal agenesis and uterine anomalies: how and when can we make this diagnosis?

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## ABSTRACT

A 12-year-old female with a prenatal diagnosis of left kidney agenesis was hospitalized with a history of four months of recurrent abdominal pain and dysmenorrhea after menarche. Imaging investigation revealed a gynecological malformation associated with Müllerian developmental defects – duplicated uterus with an obstructed left hemi-uterus filled with hematic content (haematometra), one cervix and a normal vagina. We pretend to alert pediatric physicians about the association of renal agenesis and gynecological malformations, most frequently uterine, but also vaginal. Early detection of these malformations by imaging will anticipate therapeutic measures to relieve symptoms, mostly recurrent abdominal or pelvic pain, and to avoid complications such as endometriosis, pelvic adhesions and infections.

**Keywords:** Pediatrics; renal agenesis; uterine anomalies

## AGENESIA RENAL UNILATERAL E ANOMALIAS UTERINAS: COMO E QUANDO DEVEMOS FAZER O DIAGNÓSTICO?

### RESUMO

Adolescente de 12 anos de idade com diagnóstico pré-natal de agenesia renal esquerda, foi internada com uma história de quatro meses de evolução de dor abdominal recorrente e dismenorreia após a menarca. A investigação imagiológica revelou uma malformação uterina associada a defeitos de desenvolvimento do canal de Muller – útero duplicado com hemi-útero esquerdo obstruído e com conteúdo hemático (hematometra), um colo uterino único e uma vagina normal. Pretendemos alertar para a associação entre agenesia renal unilateral e malformações ginecológicas, a maioria uterinas, mas também vaginais. A sua deteção precoce por métodos imagiológicos permite antecipar medidas terapêuticas para alívio sintomático, sobretudo dor abdominal ou pélvica recorrente, bem como evitar as complicações associadas (endometriose, aderências pélvicas ou infeções).

**Palavras-chave:** Agenesia renal; malformações uterinas; pediatria

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## INTRODUCTION

Congenital unilateral renal agenesis occurs in approximately 1:1300 births and is probably underestimated due to its common asymptomatic course.<sup>1</sup> It is frequently associated with other abnormalities, including isolated or syndromic anomalies of the cardiovascular, skeletal, central nervous and urogenital systems. These include Müllerian duct anomalies (MDA) resulting in uterine and/or vaginal defects at the same side of the absent kidney.<sup>1</sup> MDA duct anomalies are rarely diagnosed prenatally. The neonatal period is an excellent opportunity to detect gynecologic malformations due to the physiologic enlargement of the uterus influenced by maternal and placental hormones.<sup>2</sup> Thereafter, uterine malformations can go undetectable until puberty. Clinical manifestations often start during adolescence, with the onset of menarche, presenting with cyclic pelvic pain caused by an obstructed structure, with or without menstrual abnormalities.<sup>3</sup> Additional complications include recurrent infections, pelvic adhesences and endometriosis.<sup>3</sup>

The diagnosis of unilateral renal agenesis must alert the physician to look for associated genital anomalies, ideally during neonatal period or at peri-pubertal age, avoiding complications or even unnecessary emergent surgery in patients with abdominal or pelvic pain that might be confused with other causes of acute pelvic pain.

## CASE REPORT

A 12-year-old female, with a prenatal diagnosis of left kidney agenesis, started recurrent abdominal pain and dysmenorrhea after menarche.

Family history was negative for renal or urinary defects.

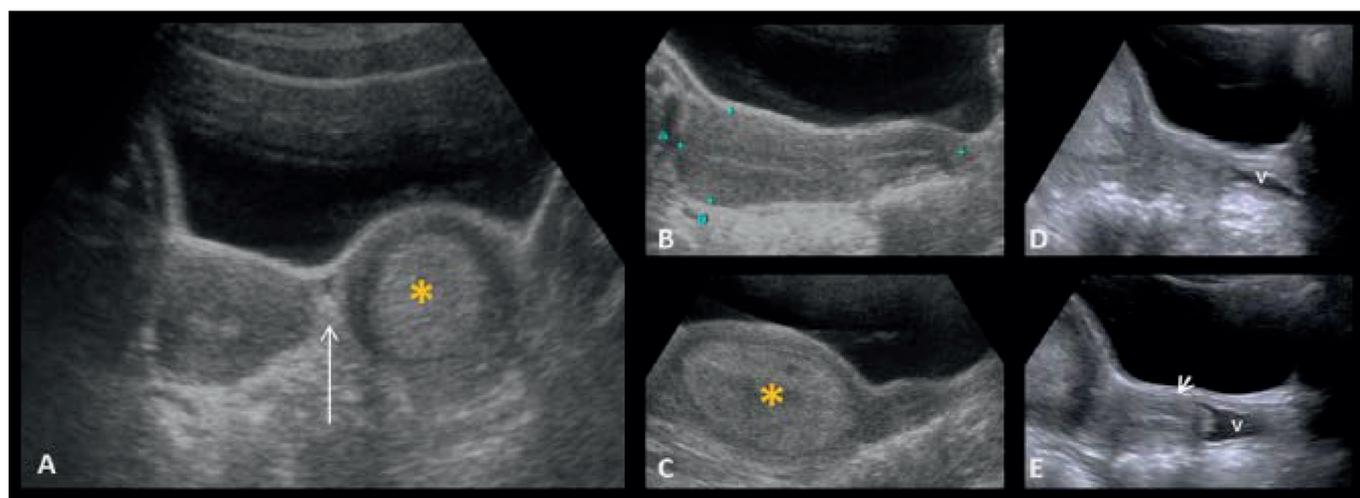
Her gestation was a full term pregnancy, the first of her mother. At 24 weeks, a prenatal diagnosis of left kidney agenesis

was done by fetal ultrasound (US). The newborn was light for gestational age (2495g), but otherwise clinically well. She had an uneventful perinatal period.

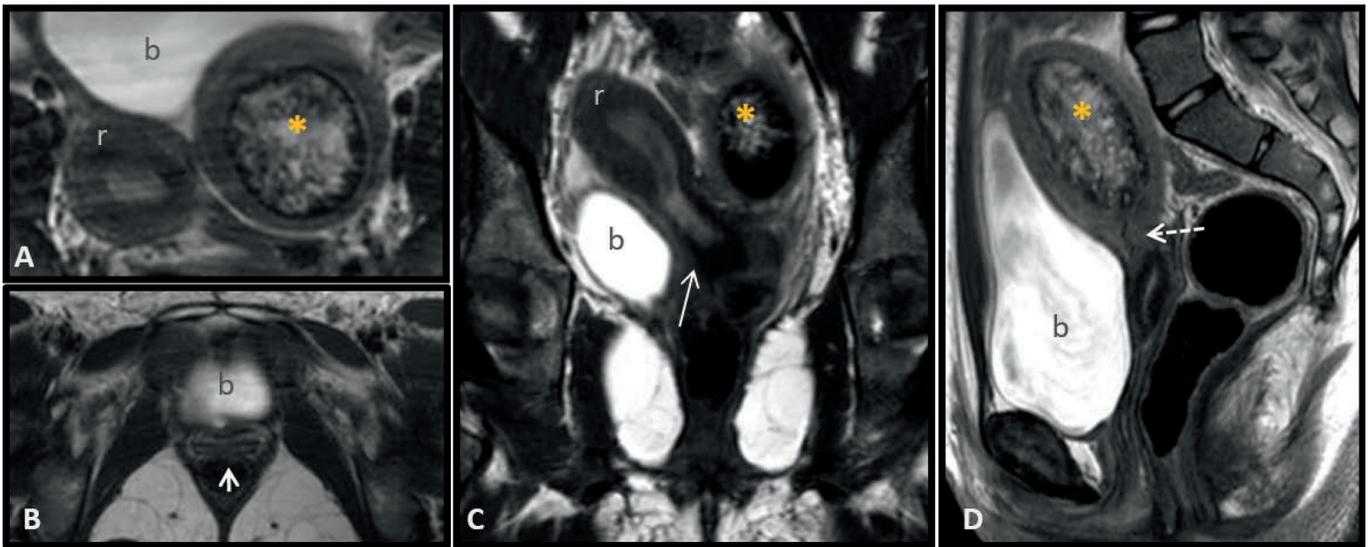
She was referred to our pediatric nephrology clinic at the age of eight months. US revealed a single right kidney with compensatory hypertrophy with mild pelvicalyceal dilation. Radiological cystography was negative for vesicoureteral reflux; renal scintigraphy showed a single right kidney with no lesions; DTPA-renogram showed a good kidney function and a normal excretion pattern.

During the first years of life she had several urinary infections, with no renal scar formation. She maintained a normal glomerular filtration rate, and microalbuminuria was first detected by the age of nine. No hypertension was found during follow-up.

By the 12 years of age, coincident with menarche, she started recurrent abdominal pain and continuous menstrual bleeding. She was observed by gynecologist and started on a contraceptive pill (ethinylestradiol and gestodeno) without improvement. She was admitted four months later with severe abdominal pain, especially in the lower quadrants without fever, vomiting, diarrhea or urinary symptoms. On physical examination vital signs were normal, and there was no palpable abdominal mass. Analytic assessment (blood count, renal function and urine analysis) was normal. Transabdominal pelvic US (fig.1 A-C) revealed two divergent hemi-uteri, one single cervix and a non-septate vagina. The right hemi-uterus was normal, and in continuity with the cervix and vagina. The left hemi-uterus had normal size but its endometrial cavity was obstructed and filled with echogenic fluid (haematometra). At the level of the istmus, the left-sided uterus was in close connection with the right-sided uterus, although a normal cervix could not be detected. The ovaries were normal in size and



**Figure 1** - Transabdominal pelvic US: Transverse (A) and longitudinal (B,C) transabdominal pelvic US images showing a duplicated uterus, with two hemi-uteri separated by a large fundal cleft with echogenic fat (arrow): a normal right hemi-uterus in continuity with a normal cervix (B) and a markedly distended left sided endometrial cavity with echogenic content – hematometra (\*) (C). US genitography longitudinal plan (D,E) after retrograde instillation of saline into the vagina (v) confirmed the presence of only one cervix (arrowhead) and absence of vaginal septum.



**Figure 2** - Pelvic magnetic resonance imaging: Axial (A,B), coronal (C) and sagittal (D) T2-weighted MR images demonstrate behind the urinary bladder (b) two separate uteri with non-communicating endometrial cavities, a normal right hemi-uterus (r) in continuity with a single cervix (arrow) and a normal vagina (arrowhead). The obstructed, dilated left hemi-uterus contains heterogeneous haematic debris (\*) ending in a fibrous band type structure interpreted as a probable atretic left cervix (dash arrow).

shape. Even after US genitography performed during retrograde instillation of saline into the vagina (fig.1 D, E), it was difficult to assure the exact level of obstruction. For further anatomic delineation, a pelvic magnetic resonance imaging (MRI) was performed (fig.2), revealing two normal-sized divergent hemi-uteri with non-communicating endometrial cavities and a preserved myometrial width in both uterine horns. The right hemi-uterus showed a normal size and morphology in continuity with one apparent normal cervix. The left hemi-uterus was obstructed at the level of the istmus with haematometra. No evidence of vaginal duplication was seen. According to these findings, the girl had a left renal agenesis and an associated MDA - probably an anatomic variant of didelphys uterus with left cervical atresia and a normal vagina.

Surgery has been considered the most appropriate treatment, and is planned to be performed soon.

## DISCUSSION

In unilateral renal agenesis, the embryonic insult that occurs in the ureteral bud may also affect the Wolffian duct in males and the Müllerian duct in females. From an embryologic perspective, the Müllerian system defects can result from agenesis of structures, vertical fusion defects and lateral fusion defects, which can occur isolated or combined in more complex malformations. Lateral fusion defects are the most common MDA and also more often associated with renal abnormalities. MDA are usually categorized according the American Fertility Society classification.<sup>3,4</sup>

Despite undoubtful usefulness of this grading system in clinical practice, there are some cases that may be difficult to classify, particularly when lateral fusion defects are associated

with partial agenesis of structures, like in our patient's case.

The above mentioned classification, divides uterine defects in septate uterus (one uterus with endometrial cavity divided by a total or partial septum), unicornuate uterus (normal hemi-uterus, fallopian tube and cervix in one side, and abnormal structures on the other side - mostly a rudimentary horn, which may not communicate with the uterus); bicornuate uterus (one uterus with an indented fundus, having various separation degrees of the uterine horns) and didelphys uterus (duplication of the reproductive structures - two uterus and two cervix, often associated with vaginal septum - double vagina).<sup>3-6</sup>

Almost all of these defects can result in some degree of obstruction, particularly if associated with partial agenesis of structures or with a transverse vaginal septum, causing pain after the onset of menarche when the endometrial cavities shed.<sup>6</sup>

Nevertheless, some defects may be asymptomatic and diagnosed in later in life, during investigation of infertility or recurrent miscarriage.<sup>3</sup>

The diagnosis of unilateral renal agenesis can be done as soon as 10-12 weeks of gestation by US.<sup>1</sup> Unilateral renal agenesis is accompanied by gynecological malformations in around 37-60% of cases.<sup>7</sup> Other less frequent urinary tract malformations, such as horseshoe kidney, pelvic kidney, multicystic dysplastic kidney and duplication of the collecting system, can also be associated with MDA.<sup>3,8</sup>

These anomalies are usually asymptomatic, and very difficult to detect by imaging studies during infancy, except in the first two to three months of life and around or after puberty.<sup>2,3</sup> US is a very important tool for kidney evaluation, but it has some limitations in the evaluation of pre-pubertal uterus due to its small size in the absence of estrogenic stimulation. Nevertheless, US is the

first-line imaging modality in the evaluation of the gynecologic system.<sup>9</sup> Additional information can be obtained by US after retrograde saline filling of the vagina (US genitography), and adequate acoustic window can be achieved using retrograde saline filling of the bladder (before achievement of urinary sphincter control) and/or of the rectum.<sup>2,9</sup>

Although MRI has been considered the gold standard for the diagnosis of reproductive tract defects, because of its excellent imaging of both internal and external contour of the uterus in adulthood and older children; this might not be true for small children.<sup>3,5,6,9</sup> Even with MRI, detailed anatomic assessment of the infantile non-obstructed uterus might be difficult. Some authors recommend genital tract evaluation by MRI in all prepubertal girls with known renal abnormalities in order to prevent later complications.<sup>10</sup> In our opinion, and also according to other authors, in pediatric patients a dedicated and complete genital US examination is still the most important imaging technique, and MRI should be regarded as an additional tool for doubtful and/or complex cases.<sup>9</sup>

Several cases are described in the literature associating unilateral renal agenesis and uterine and/or vaginal defects. A recent series of 87 patients with uterine anomalies and renal agenesis showed a predominance of uterus didelphys (77%) followed by bicornuate uteri (11,5%); and over 95% of associated obstructed hemivagina.<sup>11</sup> The association of renal agenesis and didelphys uterus with unilateral cervical atresia, as in our case description, was found in only 4,5% of those cases.<sup>11</sup>

Our case illustrates a 12-year-old female with a rare association of unilateral renal agenesis and a didelphys uterus with unilateral cervical atresia and a normal vagina. The diagnosis was done by US and MRI, after four months of pelvic and abdominal pain associated with metrorrhagia. At that point, an obstructed left hemi-uterus with haematometra was found.

We intend to alert pediatricians, nephrologists and radiologists for the association between unilateral renal agenesis and uterovaginal anomalies. The neonatal period is an excellent opportunity to detect gynecologic malformations. US and MRI are very important non-invasive tools to characterize the possible abnormality. The early detection of defects will anticipate uterovaginal therapeutic measures to prevent symptoms and future complications.

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