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MULLERIAN DUCT ANOMALIES – A SURPRISING COMPLICATION IN NULLIPARA PREGNANCIES – A CASE SERIES

Obstetrics & Gynaecology

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ABSTRACT

Mullerian duct anomalies arise from incomplete fusion or absorption of primordial ducts. While most patients remain asymptomatic throughout the duration of pregnancy. There is an increased risk of rupture in the second trimester, causing maternal and perinatal morbidity and mortality. We present three cases of abnormal uteri during pregnancy in nulliparous condition. The first case threatened second trimester pregnancy with acute abdominal symptoms and shock. She underwent exploratory laparotomy revealing a ruptured left rudimentary horn with 1 liter of hemoperitoneum. The fetus and placenta were located in the abdomen, and resection of the rudimentary cornua was performed. The second case concerned a complicated term pregnancy with intrauterine fetal demise (IUFD). Emergency lower segment cesarean section (LSCS) was necessary due to failed induction, revealing a uterine rupture at the anterolateral surface of a unicornuate uterus with a communicating horn. The ruptured cornua was surgically removed. Third case involved successful term twin gestation in a unicornuate uterus with agenesis of left rudimentary cornua. Presented series underscores the importance of maintaining a high index of suspicion for this uncommon pregnancy complication. **SYNOPSIS:** Pregnancy involving Müllerian anomalies is uncommon and can lead to severe complications like rupture uteri. Early detection is crucial to prevent maternal death.

KEYWORDS

INTRODUCTION

Pregnancy complications associated with uterine anomalies include miscarriage, ectopic pregnancy, premature labor, abnormal fetal presentations, and placental abruption. [1]

Classification of these anomalies categorizes them based on the extent of developmental failure, which dictates their clinical presentation, treatment options, and potential reproductive outcomes [2] The primary deformities stemming from defective Müllerian ducts are categorized as: 1. Absence of both ducts, either partially or completely. 2. Development of one paramesonephric duct unilaterally, with incomplete or absent development of the opposite side. 3. Lack of or improper fusion of the ducts along the midline. 4. Defects in the canalization process.

The relationship between uterine anomalies and adverse outcomes in late pregnancy remains relatively understudied, prompting the inclusion of these intriguing cases in this study. The authors propose that uterine anomalies may contribute to preterm birth, risk of rupture, non-progress of labor due to reduced muscular mass, particularly in cases of unicornuate uterus.

METHODOLOGY

This study involves 3 patients presented at labor room at Department of Obstetrics & Gynecology- Tertiary healthcare facility which were promptly managed as discussed below.

Inclusion criteria –

1) Women delivering in our tertiary health care center.
2) Women with Mullerian anomalies diagnosed clinically or using imaging modalities or both.

In all women nominated for analysis of research an informed written consent was obtained. Detailed case study notes followed by complete general and physical examination was done. Gestational age was determined by the first day of the woman's last menstrual period (LMP). Expected date of delivery is calculated after knowing the initial day of the last menstrual period. If there was a calendar value disturbance between LMP and first ultrasound then the first ultrasound due date was confirmed as the expected date of delivery . We observed and recorded the date of women until discharge.

CASE 1

At the age of 22 pregnant twice, with one abortion, was at 22+1 weeks of pregnancy presented with acute lower abdominal discomfort lasting for six hours. Upon admission, she was in shock, exhibiting light coloured body, peripheral hypothermia , a weak and rapid pulse of 140 beats per minute, blood pressure of 90/60 mm of hydrargyrum,hypotension and hyperventilation . Her abdomen was notably enlarged to the size typical of a 24-week pregnancy, tense, and tender throughout. Upon duckbill Speculum examination revealed no cervical or vaginal abnormalities, and the cervical os was not dilated without any spotting. Immediate treatment included intravenous fluids and a blood transfusion for resuscitation. An emergency midline laparotomy was performed suspecting ruptured uterus and fetal demise. During surgery, approximately three liters of blood and clots were found intraperitoneally. The left rudimentary cornua of the uterus was a complete rupture along with the fetus was discovered inside an intact amniotic sac, weighing 430 grams, accompanied by approximate 1000 grams of clots. The premature placenta and cord were attached with the uterine cornua without placental adherence. The left tubo -ovarian anatomy was normal; it was attached to the left rudimentary cornua.

The amniotic sac contained deceased fetus discoid placenta and membranes were removed from the abdominal cavity. Clamps were applied in succession to supporting structure i.e the left round ligament, left tubo-ovarian ligament and left uterine artery followed by cutting and transfixation work . The left rudimentary cornua was clamped above the pedicle of uterine artery and excised. The probe confirmed communication. The uterus located separately was non firm , rounded and 8 weeks dimension. The right tubo -ovarian anatomy was intact with proper attachment to the unicornuate uterus. The patient's genital tract anomaly was classified as U4A C0 V0 according to ESHRE-ESGE criteria and Class 2 according to ASRM classification.

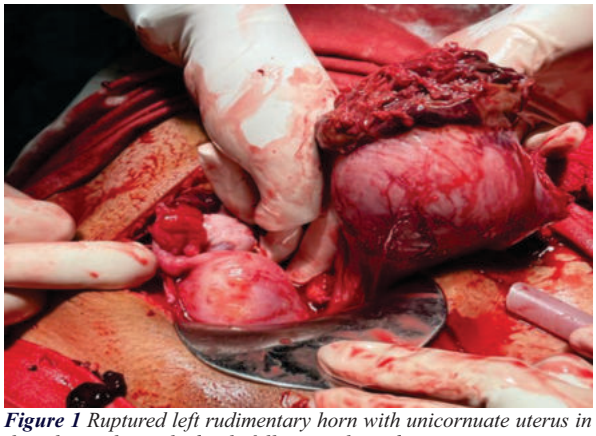

Figure 1 *Ruptured left rudimentary horn with unicornuate uterus in the pelvis with attached right fallopian tube and ovary.*

Surgical intervention involved excision of the rudimentary horn and left fallopian tube, while preserving the left female gonad.After achieving hemostasis peritoneal washing and placement of an intraperitoneal drain was done. The abdomen was closed in layers. No renal anomalies were detected.

During and immediate postoperative period, the patient received three units of packed red blood cells and four units of fresh frozen plasma.During her unremarkable postoperative recovery ,she was treated with intravenous ceftriaxone and metronidazole for five days. The removal of the drain was on the fifth postoperative day. Then she was transitioned to oral antibiotics. She was released on the tenth day after surgery, with counseling on contraception, emphasizing the importance of continued contraception for at least two years.

CASE 2

At age of 25 having first conception nearing 38 weeks gestation with an intrauterine fetal demise of 28 weeks.Prior ultrasonographic evaluation had indicated Potter's syndrome in the fetus. Her obstetric history included an emergency lower segment cesarean section performed a month ago at another hospital due to oligohydramnios AFI-2 cm.However, the procedure was left halfway because of pus-filled pockets around the uterus and surrounding tissue. She had subsequently completed a seven days regime of injectable antibiotics including meropenem and metronidazole.

We were surprised to have no signs of septicemia and had no significant medical condition apart from prior two pint blood transfusion for anemia.Although her Mantoux test was positive, her hemoglobin, hepatic & renal function panel and coagulation panel was within standard range.Uterine contraction has stopped and cervix remained undilated.An unanticipated untowards condition had occurred. A cesarean section was necessitated due to inadequate progress in labor. During the procedure, uterine rupture was detected besides the broad ligament of the uterus, with the amniotic sac protruding out.

Following amniotomy, thick meconium-stained amniotic fluid was drained and the baby was delivered using the Patwardhan technique. The placenta was deeply embedded and could not be separated from the uterine tissue. Numerous abscesses, pockets and tubercles were noted on the uterine surface, lateral peritoneum and anterior abdominal wall.Futher exploration revealed unicornuate uterus with a communicating rudimentary horn locate posterior the sigmoid colon and adhered to the posterior peritoneum. The ruptured rudimentary cornua was removed.

The patient's genital tract anomaly was classified as U4A C0 V0 according to the ESHRE-ESGE criteria and Class 2 according to the ASRM classification. The extracted tissue was forwarded for microscopic diagnosis by pathology laboratory and Mycobacterium tuberculosis detection. TB was detected, leading to the initiation of anti-tubercular treatment for the patient. The patient jolly good and postoperatively released on the tenth day after surgery.

Figure 2 *Ruptured rudimentary horn with adherent placenta and pus pockets on uterine serosal surface.*

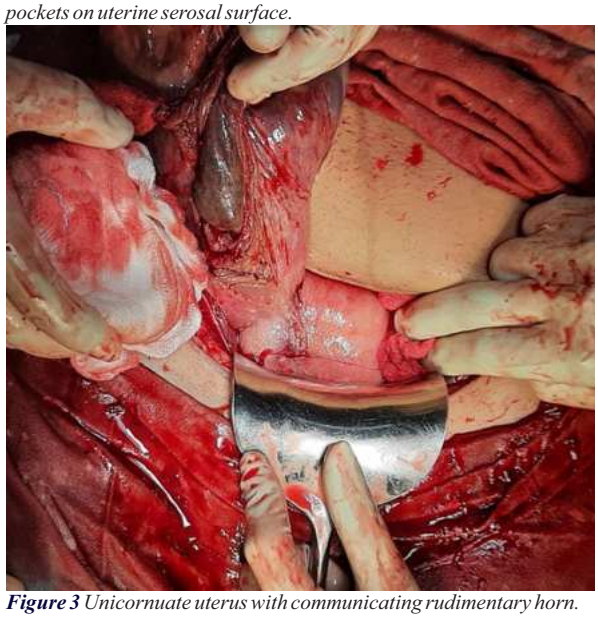

Figure 3 *Unicornuate uterus with communicating rudimentary horn.*

CASE 3

At the age of 30 having first conception with 37+2 weeks DCDA twin pregnancy presented with off and on labor pains. On admission found no history of major illness and she was hemodynamically stable.

Ultrasonography revealed Twin A in transverse lie and Twin B in breech presentation. The patient was promptly taken for a lower segment cesarean section.

During surgery, it was unexpectedly revealed that the uterus was unicornuate, with both twins positioned transversely within the unicornuate horn. The left fallopian tube was found at a lower level in the uterine segment as compared to the right fallopian tube. Both Twin A and Twin B were delivered via breech extraction, weighing 2.3 kg and 2.2 kg respectively.

The patient's genital tract anomaly was categorized as U4B C0 V0 According to the ESHRE-ESGE classification and as Class 2 according to the ASRM classification.

The under treatment person was fine and released on the fifth day postoperatively.

Case 3:

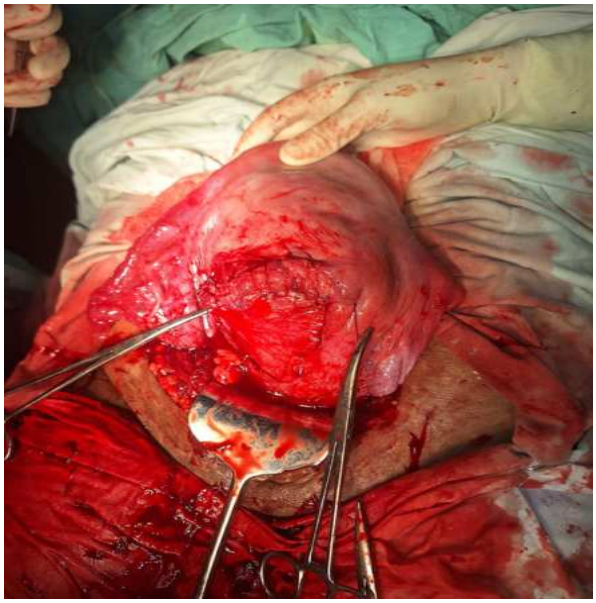

Figure 4 *Unicornuate horn with left fallopian tube at a lower level in the uterine segment compared to the right fallopian tube.*

Figure 5 Hysterosalphingogram of Case 3 showing unicornuate uterus post delivery.

DISCUSSION

Uterine anomalies are in range of 0.1% to 3% of the community, this prevalence escalates to 3.5% among women grappling with infertility, and surges to about 13% in those experiencing recurrent pregnancy loss. The unicornuate uterus represents 2.4% to 13% of Mullerian anomalies [3], with 84% of these cases involving a contralateral rudimentary cornua. [1] The approximated incidence of rudimentary cornua pregnancy is one in 76,000 pregnancies.[4]

Table 1:"ESHRE-ESGE Classification Of Mullerian Anomalies [9]: -

Cervix	Vagina	Uterus
Cervix: - *C0:* Normal cervix - *C1:* Septate cervix (presence of a septum dividing the cervix) - *C2:* Double cervix with normal morphology - *C3:* Unilateral absence or malformation of the cervix - *C4:* Complete absence or significant malformation of the cervix	- *V0:* Normal vagina - *V1:* Longitudinal vaginal septum that is not obstructive - *V2:* Longitudinal vaginal septum causing obstruction - *V3:* Transverse vaginal septum or hymenal obstruction - *V4:* Vaginal aplasia (absence of the vagina) V0: Normal vagina V1: Longitudinal non-obstructing vaginal septum V2: Longitudinal obstructing vaginal septum V3: Transverse vaginal septum/imperforate hymen V4: Vaginal aplasia	- *U0:* Normal uterus - *U1:* Dysmorphic uterus, including T-shaped or infantile forms - *U2:* Septate uterus, which may be partial or complete - *U3:* Bicornuate uterus, either partial or complete - *U4:* Unilaterally formed uterus, including: - Rudimentary horn with a cavity (which may or may not communicate with the uterine cavity) - Rudimentary horn without a cavity or complete absence - *U5:* Aplastic uterus, including: - Rudimentary horn with a cavity (unilateral or bilateral) - Rudimentary horn without a cavity or complete absence (unilateral or bilateral) - *U6:* Unclassified uterine anomalies that do not fit the other categories

* The ASRM (American Society for Reproductive Medicine) classification for Mullerian anomalies [8] is as follows:

Class I: Uterine Agenesis and Hypoplasia
- *Class Ia:* Mayer-Rokitansky-Küster-Hauser (MRKH) syndrome, characterized by the absence or underdevelopment of the uterus and the upper two-thirds of the vagina.
- *Class Ib:* Complete absence of the uterus with rudimentary horns present.

Class II: Unicornuate Uterus
- Uterus with a single horn and a rudimentary horn on the opposite side.

Class III: Uterus Didelphys
- Complete duplication of the uterus, cervix, and vagina.

Class IV: Bicornuate Uterus
- Uterus with two distinct horns and a single cervix.

Class V: Septate Uterus
- Uterus with a normal external shape but divided internally by a septum.

Class VI: Arcuate Uterus
- Uterus with a slight indentation at the fundus but lacking a septum.

Class VII: DES-related Anomalies
- Uterine malformations resulting from exposure to diethylstilbestrol (DES) during fetal development.

There are several classifications of congenital reproductive anomalies. These include VCUAM [5] as proposed by Acien and Acien [6], and the Buttram-Gibbon's system [7] which has been modified by the American Society For Reproductive Medicine ASRM [8]; and the classification system developed by European society of Human Reproduction and Embryology (ESHRE) and the European Society for Gynecological Endoscopy(ESGE) [9] ,which is based on anatomical features, embryological origin, and severity of the anomalies. In our case series we have employed our cases according to ESHRE-ESGE and ASRM classification. The ESHRE-ESGE classification for Mullerian anomalies categorizes uterovaginal malformations into the following types.

Structural abnormalities in the uterine cavity, including anomalies affecting the uterine space, musculature, and distensibility, severely compromise pregnancy maintenance. These anomalies disrupt the even distribution of pressure within the uterine cavity, further complicating uterine growth. Such disruptions are associated with a heightened risk of late miscarriage, preterm birth, and a significant increase in the likelihood of uterine rupture, which can occur in up to 81% of cases [10].

Clinical pregnancy rates are markedly diminished in the presence of septate and unicornuate uteri. Specifically, women with canalization defects face more than a threefold increase in the risk of miscarriage, while those with bicornuate uteri encounter a two-fold increased risk. Conversely, this heightened risk of threatened abortion is not observed in cases of unicornuate and didelphys uteri. Additionally, these anomalies are linked to a plethora of fetal and obstetric complications: low birth weight (with a two fold risk), intrauterine growth restriction (exceeding a threefold risk), intrauterine fetal demise (a two and half fold more risk), perinatal mortality (a threefold risk), low lying placenta (a risk over threefold), and cervical insufficiency (with a ninefold risk). Septate uteri and fusion defects similarly present a fivefold increase in the chance of premature preterm rupture of membranes (PPROM) [10].

A clinician managing ectopic and cornual pregnancies, particularly during the early trimesters or in instances of failed induction must keep in mind the possibility of diagnosis of rudimentary cornua pregnancy. Early and accurate detection through pre-rupture ultrasound or magnetic resonance imaging is essential to mitigate the risk of maternal mortality [11].2D ultrasound and hysterosalpingography are useful for early detection for unicornuate uterus, while 3D ultrasound and magnetic resonance imaging are effective for accurately classifying unicornuate uterus. [12-15]

Hysterosalpingo-contrast-sonography is minimally invasive but

examiner-dependent, providing detailed views of the cervix and uterine cavity, with potential false negatives due to uterine cavity distention. [12,19]

X-ray hysterosalpingography is invasive, focusing only on the uterus and tubes for infertility, without assessing external contours or distinguishing certain uterine anomalies. [12,20]

Additionally, screening for associated renal tract anomalies is recommended in these patients.

Magnetic Resonance Imaging is a non interventional and highly valuable detection tool for assessing Mullerian anomalies [8], offering a comprehensive visualization of both intrauterine and extrauterine soft tissue structures while avoiding the risks associated with radiation exposure [12-20][21].

Tsafrir [21] delineates the criteria of early detection of rudimentary cornua pregnancy as follows:
"- The appearance mimics an asymmetric bicornuate uterus.
- There is an absence of image based continuity between the canalis cervicis uteri and the lumen of the pregnant cornua.
- Muscular coat of the uterus encircles the amniotic sac."

Hysteroscopy, though minimally interventional, provides standard insights into the vagina and ascending parts of the cavity of the uterus but does not evaluate external dimensions of the uterus.

Laparoscopy, being invasive, allows for the assessment of external uterine contours and peritoneal structures, yet it does not measure uterine wall thickness and depends heavily on the examiner's insight and interpretation.

Surgical correction of a unicornuate uterus is required when a cavitated, separated rudimentary uterine cornua causes pain due to obstructed menstrual flow. This reduced muscle mass can result in isthmus-cervical incompetence, which may necessitate cerclage in future pregnancies [22].

Management of rudimentary cornua pregnancy typically necessitates the resection of the cornua and the same side tube, whether this is accomplished through laparotomy or laparoscopy, regardless of the trimester [23]. The inaugural documented laparoscopic removal of a rudimentary horn took place in 1996, with the resection performed via a vaginal incision [24]. Recent advancements in laparoscopic techniques have made this approach particularly attractive due to its advantages of reduced recovery times. George [25] reviewed eight cases spanning a 21-year period, where all patients underwent surgical laparoscopic resection of functional, separate rudimentary horns. Among these patients, seven successfully conceived, with two requiring assisted reproductive technologies. All resulting pregnancies ended in preterm deliveries via cesarean section around 33 weeks' gestation.

Early surgical intervention, involving the excision of the underdeveloped horn along with the corresponding fallopian tube, is generally advocated to avert future ectopic pregnancies [26]. Notably, Oral B et al. previously reported a case of a pregnancy within a rudimentary uterine cornua that ruptured at 14 weeks and was complicated by placenta accreta; similarly, our case 2 also involved placenta accreta [27].A case Study involving a multifetal pregnancy within a unicornuate uterus with a seperate underdeveloped horn required a cesarean section to deliver each fetus from a separate cornua, achieving the optimal outcome [28].

Limitations stemming from the absence of a comparison group,retrospective nature of the study and concentration on particular cases which may constraint the applicability of the result and the capacity to make conclusive inference. Further research should incorporate larger sample size, randomized control trial or cohort studies to yield more reliable evidence and reduce biases. In addition, long-term follow-up studies are crucial to assess reproductive outcomes.

CONCLUSION:

Women having an anomalous uterus face heightened risks of pregnancy related complications, including spontaneous abortion, premature delivery, uterine dehiscence, the placenta accreta spectrum, malpresentation and cesarean delivery. Recognizing these risks is crucial for managing pregnancies in affected women effectively. Advanced imaging is imperative for accurate diagnosis, enabling timely obstetric interventions to prevent complications. It will serve as reference for healthcare professionals managing similar cases of pregnancy in unicornuate uterus and thus aid in preventing maternal mortality.

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