

## Case Report

# Laparoscopic resection of the rudimentary horn of a unicornuate uterus diagnosed by three-dimensional computed tomography

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A 16-year-old woman was admitted to the emergency room due to severe lower abdominal pain. She had no surgical or obstetric history. Menarche had occurred 2 years ago. She suffered from dysmenorrhea and pelvic cyclic pain during menstruation. The three-dimensional computed tomography combined with ultrasonography revealed a rudimentary horn of unicornuate uterus. We performed a laparoscopic removal of this uterine anomaly without any complication in the post-operative period. Laparoscopy resulted in anatomical and reproductive outcome equivalent to those offered by a laparotomic approach, and minimally invasive surgery had additional advantages such as, better cosmetic results and postoperative period, which are important for very young patients.

**Key words:** Uterus, laparoscopy, Imaging three-dimensional, tomography x-ray computed.

## INTRODUCTION

Uterine malformations are rare congenital abnormalities located within the female genital tract. The incidence of uterine malformation has been reported to be between 0.1 and 3% (Lee et al., 1999). However, the incidence rate is not well defined, as many patients with this condition are asymptomatic.

Malformation of the uterus has already been recorded, according to Buttram and Gibbons (1979). A new classification system based on the degree of abnormal development was used to separate the anomalies into groups. Numerous characteristics were evaluated, including uterine absence and the presence of a unicornuate uterus, rudimentary uterine horn, blind uterine horn, and symmetrical double uterus.

Unicornuate uteri are classified into four groups by the American Society of Reproductive Medicine (ASRM) as:

(1) a unicornuate uterus with a communicating rudimentary

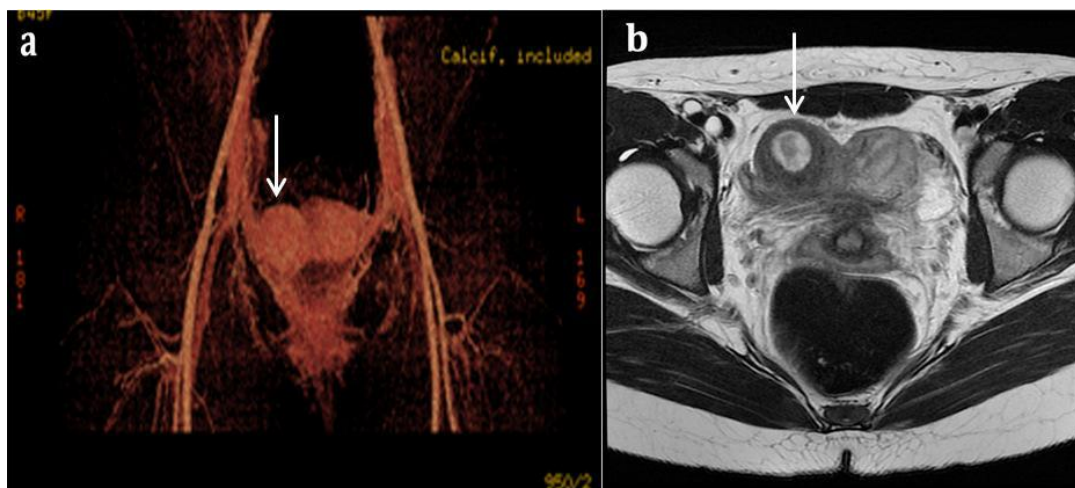
horn; (2) a unicornuate uterus with a non-communicating rudimentary horn; (3) a non-cavitated unicornuate uterus with a non-communicating rudimentary horn; and (4) an isolated unicornuate uterus (The American Fertility Society, 1988). The unicornuate uterus with non-communicating rudimentary horn is the most common type. Complications of the rudimentary horns include endometriosis, primary infertility, hematometra, and associated renal anomalies (Kadan and Romano, 2008). The symptoms do not appear until menarche. Alternatively, the presenting symptoms may be non-specific. For these reasons, the diagnosis is often made late. As a result, the diagnosis of complications is also late (Liatsikos et al., 2010).

Here, we present a case of laparoscopic resection of the rudimentary horn of a unicornuate uterus diagnosed by three-dimensional computed tomography (CT).

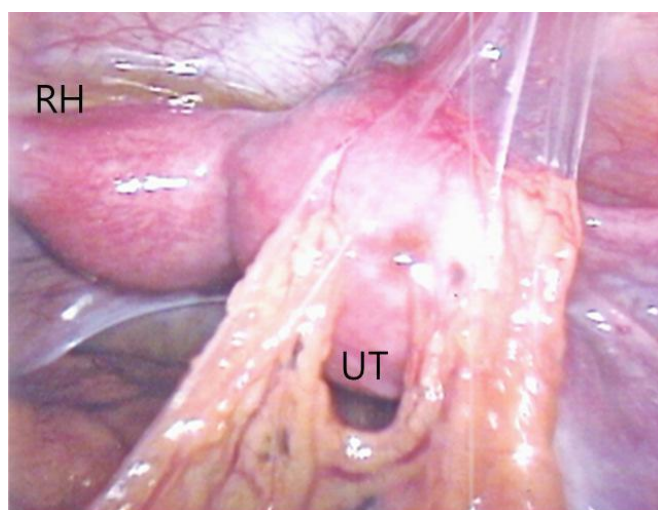
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## CASE REPORT

A 16-year-old virgin visited the emergency room for an abdominal problem. The patient had experienced an episode of pain in the



**Figure 1.** Three-dimensional computed tomography (CT) revealed a non-communicating cavitory horn (arrow) at the right side of the uterus (a); axial slice of abdominal CT shows uterine leiomyoma with internal hemorrhage (arrow) in right side (b).



**Figure 2.** Unicornuate uterus (UT) with the rudimentary horn (RH) and adhesion.

lower abdomen starting the day before admission. As time passed, the intensity of the pain became more severe. There was no history of sexual intercourse. The patient had previously been diagnosed with endometriosis, and first visited the outpatient clinic 4 years previously. Dysmenorrhea lasted for one year. There were no other specific findings. Menarche started at 12 years of age. Her menstrual cycle was 30 days, with a normal amount of bleeding. She had severe dysmenorrhea since age 13, which was 18 months after menarche. She was followed up by our outpatient department for dysmenorrhea.

The patient was alert, with a blood pressure of 100/60 mmHg and heart rate of 110 beats per minute. Her respiratory rate was 20 breaths per minute, and body temperature was 37.5°C. Upon examination, her abdomen was soft with light tenderness in the lower abdominal area. However, rebound tenderness was not present during abdominal examination. The patient's white blood cell count was  $11,020/\text{mm}^3$  and her hemoglobin concentration was

12.2 g/dl, with a normal platelet count; otherwise, test results were unremarkable. An ultrasound revealed a right-sided uterus and a homogenous mass without blood flow. Both ovaries appeared to be normal.

The normal contour of the uterine fundus was not seen on contrast-enhanced computed tomography (CT). The two horns were separated, with each connected to the fallopian tubes. The right horn was not communicating.

A three-dimensional (3D) surface rendering technique using images of the uterus showed the overall shape and contours, suggested that the two uterine horns were widely separated because of a fusion anomaly (Figure 1a); however, a magnetic resonance image was suspicious for uterine leiomyoma with internal hemorrhage and a hemorrhagic mass from the right fallopian tube (Figure 1b). The patient underwent diagnostic laparoscopy. During the operation, adhesions were observed between the uterus and the omentum, but there was no ascites. Following dissection of the uterine adhesions, the uterine horn was observed on the right side of the uterus (Figure 2). Because the basal surface of the rudimentary horn was thickly attached to the right side of the uterus, we performed a salpingectomy prior to rudimentary horn removal. There was chocolate-colored fluid in the rudimentary horn.

The boundaries between the layers of the uterus are unclear. It is best to avoid exposing the uterine lumen and creating conditions that might predispose a woman to ectopic pregnancy. At surgery, we found that the two layers of the myometrium were closed tightly. Notably, at the site of the lesion, the ureter was located close to the uterine body. To remove the rudimentary horn safely, it was necessary to locate the ureter first (Atmaca et al., 2005).

Pathologic findings revealed that the uterine horn was  $5 \times 4 \times 2$  cm in size and 17 g in weight. The normal endometrium was in the proliferative phase and chronic endometritis was also observed. There was a hematoma in the removed fallopian tube. The patient was discharged without any complications and has been followed up since without any further complications.

## RESULTS AND DISCUSSION

At six weeks of gestation, a pair of fetal Müllerian ducts

appeared, this worked their way down to the inside of the fallopian tubes during development. The Müllerian ducts met at eight weeks. The fused Müllerian nodules at the lower center were formed by the junction of two round ligaments. Above this, the Müllerian duct walls appeared with a combined center at around 16 weeks, and the uterus was formed (Baker et al., 1953).

In congenital anomalies of the uterus, Müllerian duct fusion did not occur properly, or the septum was not fused. Depending on the degree of absorption, anomalies occurred in various forms. The incidence of this anomaly was 0.17% (1 in 594) in women of childbearing age. However, the rate (3.5% or 1 in 29) was higher among relatively infertile women. The distribution of uterine anomalies has been reported as follows: arcuate type 7%, uterine septum 34%, bicornuate uterus 39%, didelphys 11%, unicornuate uterus 5%, and segmented Müllerian duct institutions hypoplasia 4%. Some congenital uterine anomalies are known to be more common (Nahum, 1998). This is similar to uterine Müllerian duct anomalies, in that patients who display clinical symptoms are more likely to be identified (Bakri et al., 1992).

The most common complications include endometriosis, dysmenorrhea, cervical hematoma, abortion, premature birth, intrauterine fetal growth retardation, and abnormal fetal appearance. The prevalence and knowledge of various types are very important to enable the diagnosis and treatment of gynecological complications.

For this case, prior to the discovery of the patient's anomaly at the age of 16, she had symptoms. There was histopathologic evidence of endometrial tissue in the lumen of the uterine horn. The symptoms were similar to those observed in patients with cervical hematoma, which may be explained by the two weeks of dysmenorrhea. In diagnosing the type of uterine malformation, magnetic resonance imaging (MRI) has shown an accuracy of 96% as compared with vaginal ultrasound (85%) and other tests (6%) (Doyle, 1992). Although 3D ultrasound reports corresponding to the results of existing diagnosis have been described, MRI is still the most standardized tool for diagnosis (Fedele et al., 2005; Perrotin et al., 1999). However, MRI is relatively expensive compared with other diagnostic tools and is not available in the office setting (Saravolos et al., 2008).

Diagnostic laparoscopy allows an evaluation of the external contour of the uterus. It also offers the added advantage of concurrent treatment, as in our case. The main disadvantage of laparoscopy is that it is invasive and is conducted under general anesthesia. The combination of hysteroscopy and laparoscopy is the gold standard for evaluating congenital uterine anomalies (Hamilton et al., 1998; Homer et al., 2000; Taylor and Gomel, 2008; Grimbizis et al., 2001). In a teenage virgin, however, diagnostic hysteroscopy is difficult to perform both for ethical reasons and due to technical difficulty, which makes the diagnosis difficult. Overall, laparoscopy combined with MRI or 3D CT provides precise, sensitive

results for diagnosing and managing a unicornuate uterus with a rudimentary horn.

In this case, we could not perform a diagnostic hysteroscopy because the patient was a teenage virgin. Therefore, we used several imaging tools to obtain a more accurate diagnosis and clarify the relationship between the anatomical abnormalities and the surrounding areas, including two-dimensional (2D) transrectal sonography, contrast-enhanced CT, 3D CT, and MRI. Although MRI suggested a uterine leiomyoma, the other tools and clinical history allowed us to develop a successful therapeutic plan.

Three-dimensional CT is constructed from axial CT images. As in this study, 3D CT is becoming increasingly useful for diagnostic imaging, including musculoskeletal issues, vascular malformations, and heart and lung disease. Additionally, 3D CT is less expensive than MRI. Previously, our research team conducted a study of the efficacy and accuracy of renal collateral 3D CT as part of an effort to expand the range of indications for this technique (Kim et al., 2010). Three-dimensional CT scans can quickly and accurately determine 3D structure. Further, visualizing the relationship between adjacent structures can facilitate the establishment of a treatment plan. When a unicornuate uterus is diagnosed in women of childbearing age, surgical removal of any rudimentary horn is desirable. The rudimentary horn has functional endometrium, which can cause peritoneal endometriosis and menstrual blood congestion, leading to abdominal pain or various mass effects. The presence of a rudimentary horn can also increase the likelihood of complications during pregnancy (Fujimoto et al., 1998).

In recent years, laparoscopy has become a viable alternative to laparotomy for managing uterine congenital anomalies. Laparoscopic resection produces the same results as laparotomy in terms of the anatomical and reproductive capacity (Zapardiel et al., 2010). A review of the literature and our case demonstrate that the excision of a symptomatic non-communicating rudimentary horn and the ipsilateral fallopian tube is possible via laparoscopy, even when complicated by hematometra, hematosalpinx, or ectopic pregnancy (Theodoridis et al., 2006; Spitzer et al., 2009; Saleh et al., 2003; Henriët et al., 2008; Park and Dominguez, 2007). Considering the smaller scar and shorter hospital stay, laparoscopic surgery should be the standard surgical treatment.

## Conclusion

We recommend using 3D CT and a laparoscopic approach to manage uterine anomalies. Although MRI is the standard imaging tool for uterine anomalies, MRI is expensive and requires more time than CT. To manage a teenage virgin, like this case, laparoscopic surgery should be considered because of the smaller resulting scar and shorter hospital course.

## ACKNOWLEDGMENT

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