Reproductive Outcome of Transcervical Uterine Incision in Unicornuate Uterus

En-Lan Xia1, Tin-Chiu Li2, Sze-Ngar Sylvia Choi3, Qiao-Yun Zhou1

1Hysteroscopic Center, Fu Xing Hospital, Capital Medical University, Beijing 100038, China
2Department of Obstetrics and Gynaecology, Prince of Wales Hospital, Hong Kong 999077, China
3Department of Obstetrics and Gynaecology, United Christian Hospital, Hong Kong 999077, China

Abstract

Background: The pregnancy outcome of the unicornuate uterus is associated with an increased risk of miscarriage, cervical incompetence, and a number of obstetric complications. However, at present, there is no accepted treatment method for women with unicornuate uterus, other than expectant measures. The aim of this study was to evaluate the reproductive outcome of transcervical uterine incision (TCUI) in patients with unicornuate uterus.

Methods: Thirty-three patients with unicornuate uterus presented to our tertiary center for infertility or miscarriage. All 33 patients underwent TCUI and were followed up for 10–52 months. The pregnancy outcomes (first-trimester miscarriage, second-trimester miscarriage, preterm, term, intrauterine death, ongoing pregnancy, and live birth) before and after TCUI were compared by t-test.

Results: Among 31 patients who attempted to conceive after TCUI, twenty conceived including one termination of pregnancy, one second-trimester miscarriage, one ectopic pregnancy, five preterm deliveries, 11 term delivery, and one ongoing pregnancy. There were 16 live births in total. There was significant reduction in the first-trimester miscarriage rate (t = 4.890; P < 0.001), increase in term delivery (t = −3.288; P = 0.002), and live birth rates (t = −4.073; P < 0.001) after TCUI.

Conclusion: TCUI appeared to improve the pregnancy outcome in women with unicornuate uterus presenting with infertility or miscarriage.

Key words: Hysteroscopy; Pregnancy Outcome; Surgery; Transcervical Incision of Uterus; Unicornuate Uterus; Uterine Anomalies

Introduction

Unicornuate uterus accounts for 4.4% of all uterine anomalies.[1] It is thought to arise from the failure in the development of one of the paramesonephric ducts, either partially (results in a rudimentary horn) or completely (isolated hemiuterus). Coexisting ipsilateral ovarian agenesis has also been reported, suggesting that this anomaly may arise as a consequence of agenesis involving all structures derived from one urogenital ridge.[2] Unicornuate uterus is frequently associated with urinary tract anomaly including renal agenesis.[3]

In women with unicornuate uterus and a separate rudimentary horn, removal of the rudimentary horn has been advocated in women troubled with severe dysmenorrhea and to avoid rudimentary horn pregnancy. Regardless of whether or not the rudimentary horn is present or has been removed, pregnancy occurring in the unicornuate uterus is associated with an increased risk of first-trimester miscarriage, second-trimester loss, cervical incompetence, and a number of obstetric complications such as intrauterine growth restriction (IUGR), preterm delivery, malpresentation, and intrauterine death [Table 1]. Specifically, the overall literature data suggest a spontaneous miscarriage rate of 19.5%, preterm delivery rate of 19.1%, and term delivery rate of 21.0%. The exact mechanism responsible for the poor reproductive outcomes in unicornuate uterus is unknown. At present, there is no accepted treatment method for women with unicornuate uterus, other than expectant measures. In this report, we described a consecutive series of 33 cases

Address for correspondence: Prof. En-Lan Xia, Hysteroscopic Center, Fu Xing Hospital, Capital Medical University, Beijing 100038, China
E-Mail: xiaenlan@126.com

This is an open access article distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 3.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as the author is credited and the new creations are licensed under the identical terms.

For reprints contact: reprints@medknow.com

© 2017 Chinese Medical Journal | Produced by Wolters Kluwer - Medknow

Received: 09-09-2016 Edited by: Ning-Ning Wang
How to cite this article: Xia EL, Li TC, Choi SNS, Zhou QY. Reproductive Outcome of Transcervical Uterine Incision in Unicornuate Uterus. Chin Med J 2017;130:256-61.
of unicornuate uterus treated by a novel surgical technique, transcervical uterine incision (TCUI), designed to widen
the narrow uterine cavity, to test the hypothesis that the adverse pregnancy outcome associated with unicornuate uterus is
related to the reduced capacity of the uterine cavity in this
group of women.

METHODS
A consecutive series of 33 infertile patients with unicornuate uterus who had been excluded from other infertility factors
admitted to the hospital from January 2010 to December 2014 were included in this study, which is approval of the
Independent Ethics Committee of Fu Xing Hospital, Capital
Medical University and also obtained informed consent from
all of the research participants. The diagnosis was confirmed
in all cases with three-dimensional ultrasonography, as
related to the reduced capacity of the uterine cavity in this
group of women.

Clinical data were reviewed from each of the patients’
hospital record, and the follow-up of their reproductive
outcome after TCUI was collected through a phone call at
regular intervals. The duration of follow-up ranged from 10
to 52 months postoperation.

Surgical details
The night before TCUI, cervical dilating stick was inserted
into the uterine canal to let the cervical canal soft and dilated.
TCUI was designed to resect the opposite uterine wall of
unicornuate horn side [Figure 1]. The patient was put under
general anesthesia and placed in lithotomy position. Under
the laparoscopic guidance, a Foley catheter was inserted
for continuous drainage and the laparoscope (Olympus
Medical Systems Corp., Tokyo, Japan) was introduced
through a 10-mm umbilical port and pneumoperitoneum
with 0.9% normal saline distention media under 100 mmHg
(1 mmHg = 0.133 kPa). Under ultrasound guidance, the
bladder was full in 200–300 ml sterile normal saline and
abdominal ultrasonography (Siemens Healthineers, Berlin,
Germany) was used during surgery. Both guidance methods
were used to avoid the risk of uterine perforation.

The cervix was dilated to Hegar 10–11, and hysteroscopic
bipolar electroresectoscope (Olympus Medical Systems
Corp., Tokyo, Japan) was inserted into the uterine cavity
with 0.9% normal saline distention media under 100 mmHg
distention pressure.

TCUI commenced with a shallow transverse incision over
the narrowed fundal part of the unicornuate horn was made
using a wire loop or needle electrode. This created a new
uterine fundus with a width of ≥2 cm. Then, a 4-cm long
vertical incision was made over the lateral wall [Figure 2],
approximately 1 cm deep over the fundal region but taper
to stop at the level of the isthmus. After the operation, an inverted
triangular-shaped uterine cavity was created [Figure 3].
A Foley catheter was inserted into the uterine cavity after
the operation, stayed in situ for 5–7 days, and then removed.
Artificial menstrual cycle treatment with estrogen and progesterone was used for two cycles. The second look was performed one month later after surgery.

Outcome measures
The patients were regularly followed at the outpatient clinic or by telephone contact. The outcome of any pregnancy was documented.

Statistical analysis
Statistical analysis was performed using statistical package for the social sciences (IBM SPSS Statistics for Windows, Version 22.0, New York, USA). Data were presented as mean ± standard deviation (SD). The pregnancy outcomes (first-trimester miscarriage, second-trimester miscarriage, preterm, term, intrauterine death, ongoing pregnancy, and live birth) before and after TCUI were compared by t-test. $P < 0.05$ was considered statistically significant.

Results
Among 33 patients with unicornuate uterus, 18 patients presented with infertility, whereas the remaining 15 patients presented with miscarriage(s). Their age ranged from 21 to 40 (30.3 ± 4.8) years. There were a total of 69 pregnancies before TCUI, which included 16 termination of pregnancies, 43 first-trimester miscarriages, three ectopic pregnancies, no second-trimester miscarriage, three preterm deliveries, three intrauterine deaths, and one term delivery. In total, there were four live births [Table 2]. However, all the four live births ended in neonatal death.

Among 33 women, 17 had left unicornuate uterus and the remaining 16 had right unicornuate uterus. In addition, 31 cases had rudimentary horn, but two cases did not. For the associated abnormalities, there were three cases of absent or rudimentary tube, one case of absent kidney, and one case of ectopic kidney on the same side of the rudimentary horn. Both ovaries were present in all cases, except one case in whom the left ovary was removed earlier because of dermoid cyst.

Among the 33 cases of TCUI, 27 cases were performed under the laparoscopic guidance and six cases under ultrasound guided. Among 27 patients who underwent laparoscopy, 24 of them had patent tube on the unicornuate side, two had blocked tubes on the unicornuate side (one become patent after fimbrioplasty), and one had absent tube as a result of previous salpingectomy for tubal pregnancy on the unicornuate side. Ten subjects also underwent concomitant surgery, including hysteroscopic division of intrauterine adhesions ($n = 6$), removal of endometrial polyp ($n = 4$), and ablation of endometriotic deposits ($n = 2$) (multiple entry). The blood loss was $12.0 ± 8.5$ (range 5.0–50.0) ml, and the operative time was $42 ± 21$ (range 15–85) min. There were no intraoperative complications encountered.

Among 33 patients, two wished to defer starting a new family after the operation for personal reasons. For the remaining 31 patients who tried to conceive, twenty women conceived (13 spontaneously, seven with the help of in vitro fertilization [IVF]), with the following pregnancy outcomes: One termination of pregnancy at...
9 weeks gestation for severe proteinuria due to nephritis, one second-trimester miscarriage due to cervical incompetence, one ectopic pregnancy, five preterm deliveries, and 11 term deliveries [Table 2]. There were altogether 16 live births. The live birth rate after TCUI was 16/18, which was significantly higher than the rate 4/50 before TCUI (t = −6.658, P < 0.01), when the whole group of subjects (n = 33) is considered. In the same table, the pregnancy outcome data before and after surgery are separately analyzed for women presenting primarily with infertility or miscarriage. Among twenty patients who conceived after TCUI, the pregnancy outcomes before and after TCUI are compared in Table 3. The live birth rate among pregnancies after TCUI (16/18) was also significantly higher than the rate of 3/29 before the operation (t = −6.658, P < 0.01). The average gestation of delivery after the operation was 38.0 ± 1.5 weeks of gestation (ranged from 35.0 to 40.0 weeks). More than 80% were delivered by lower segment cesarean section (13 out of 15), only two of them delivered vaginally.

For the neonatal outcome, all four live births before TCUI had neonatal death, whereas all 16 live births after TCUI survived beyond 28 days. The mean birth weight of babies born after TCUI was 2725.0 ± 832.7 g (ranged from 800.0 to 4000.0 g,). All babies born at term had birth weight ≥2500.0 g.

There were 11 patients who failed to conceive after TCUI: Seven with coexisting infertility factors (two with male factor, one with anovulation, one with adenomyosis, and three with significant intrauterine adhesions) present before TCUI whereas the underlying cause of infertility was unexplained in the remaining four cases. Women in this group were not ready to proceed with IVF treatment.

**DISCUSSION**

Patients with unicornuate uterus may present with infertility, cervical incompetence, and preterm deliveries. The prevalence of primary infertility in these patients had been reported to be 15%. In our series, the reproductive outcomes before surgery were much poorer than the literature review, with a live birth rate of only 5% compared with the literature average of 49.8%. This could be due to selection bias as only women with a poor reproductive history (no surviving baby) were referred to our center. We report here our experience of a novel surgical approach, TCUI, as a form of treatment for women with unicornuate uterus presenting with infertility or miscarriages. While we have shown that the miscarriage rate was reduced and live birth rate increased in our cohort, a reference to the literature data summarized in Table 1 showed that the miscarriage rate and live birth rate after TCUI also appeared to be lower and higher than the mean rates derived from the literature review, respectively.

Congenital uterine anomalies have been associated with infertility, miscarriage, IUGR, and preterm birth. It was suggested to be caused by restricted expansion of an abnormal endometrial cavity and abnormal placentation implantation. Markham and Waterhouse believed that patients with unicornuate uteri were not candidates for surgical reconstruction. On the contrary, our previous article reported three live births in unicornuate uterus after TCUI, suggesting that TCUI could improve the pregnancy outcomes of unicornuate uterus by enlarging the uterine cavity. The present study showed a statistically significant improvement in the first-trimester miscarriage, term delivery, and live birth rate after TCUI. Subgroup analysis also showed significant improvement in first-trimester miscarriage, term delivery, and live birth rate in those patients with infertility. However, in the miscarriage group, there was significant improvement in the first-trimester miscarriage rate only, but not the term delivery and live birth rates. This could be explained by the relatively small sample size.

Concerning preterm delivery in our study, although there were five preterm deliveries, two of them were iatrogenic preterm deliveries due to obstetrics cholestasis and pregnancy-induced hypertension at 35 weeks and 36 weeks, respectively. These two cases were both IVF twin pregnancies. There was one case of preterm delivery at 25+5 weeks due to cervical incompetence, and the

---

**Table 2: Comparison of the pregnancy outcome before and after TCUI among the 33 women underwent TCUI**

| Pregnancy outcome | Infertility, n | Miscarriage, n | Overall, n |
|-------------------|---------------|---------------|------------|
|                    | Pre-TCUI | Post-TCUI | Pre-TCUI | Post-TCUI | Pre-TCUI | Post-TCUI |
| Pregnancy         | 14       | 10       | 36       | 8        | 50*      | 18†       |
| First-trimester   | 13       | 0        | 30       | 0        | 43       | 0         |
| miscarriage       | 0        | 0        | 0        | 1        | 0        | 1         |
| Second-trimester  | 0        | 0        | 0        | 1        | 0        | 1         |
| miscarriage       | 0        | 2        | 3        | 3        | 3        | 5         |
| Preterm           | 0        | 2        | 3        | 3        | 0        | 1.000     |
| Term              | 0        | 8        | 1        | 3        | 1        | 11        |
| Intrauterine death| 1        | 0        | 2        | 0        | 3        | 0         |
| Live birth        | 0        | 10       | 4        | 6        | 4        | 16‡       |
| Ongoing pregnancy | NA       | 0        | NA       | NA       | NA       | NA        |

*There were 16 termination of pregnancies and three ectopic pregnancies before TCUI not included in the table; †There were one termination of pregnancy and one ectopic pregnancy after TCUI not included in the table; ‡Two sets of twins, total of 18 babies. NA: Not available; TCUI: Transcervical uterine incision.
In our series, there is one case suffered from primary infertility and right unicornate uterus and left rudimentary horn in which ultrasonography showed endometrium inside the small cavity. The left kidney is absent. Laparoscopic resection of left rudimentary horn and TCUI for right unicornate uterus was performed meanwhile under general anesthesia. The patient got pregnancy by IVF. A 3400 g healthy female infant was delivered by cesarean section at 38 gestational weeks. Pregnancies in women after laparoscopic excision of rudimentary horns should be considered as high-risk ones and should be managed accordingly to ensure a satisfactory obstetric outcome.[13] Akdemir reported coring-type rudimentary horn removal method which can remain more myometrial tissue, thus more adequate edges for suturing are preserved, which is safer to go through the pregnant course to term.[14]

TCUI appears to improve the pregnancy outcome in women with unicornate uterus, by reducing the first-trimester miscarriage rate and increasing the term delivery and live birth rates. The preterm delivery rate after TCUI remained high. Prospectively planned studies are required to confirm the benefit of TCUI, in particular, to establish whether or not the procedure should only be considered in women with an adverse reproductive history such as the cohort reported in this series.

Financial support and sponsorship
This study was supported by a grant from National Sci-Tech Support Plan (No. 2014BAI05B03).

Conflicts of interest
There are no conflicts of interest.

**References**

1. Acién P. Incidence of müllerian defects in fertile and infertile women. Hum Reprod 1997;12:1372-6. doi: 10.1093/oxfordjournals.humrep.a019588.
2. Taylor E, Gomel V. The uterus and fertility. Fertil Steril 2008;89:1-16. doi: 10.1016/j.fertnstert.2007.09.069.
3. Jayasinghe Y, Rane A, Stalewski H, Grover S. The presentation and outcome of women with congenital uterine anomalies who have a greater proportion of muscle fibers to connective tissue.[31] Moreover, asymmetric downward force exerted by an abnormal uterus, which would be even greater when pregnancy occurs, also plays a role in causing cervical incompetence. TCUI perhaps can correct the above two factors by removing the excessive muscle bulk and restore the symmetry of uterus. In our study, among those who conceived after TCUI, 3 (15%) of them had cervical incompetence, which is somewhat lower than the reported 30% incidence of cervical incompetence in the congenital uterine anomaly. The patient had successful term delivery after transvaginal cerclage at second trimester, one had miscarriage at 20 weeks, the other case had delivered a live birth at 25 weeks, but the baby died on the 28th day of life.

It had been reported that among all uterine anomalies, unicornuate uterus had the highest rate of cervical shortening and the highest rate of spontaneous preterm birth when the cervix is shortened. There is currently no convincing evidence that routine cervical cerclage should be performed in women with Müllerian anomaly. Instead, cervical length should be monitored with serial transvaginal ultrasound examinations, and elective cervical cerclage should be considered for those with cervical length <25 mm.

Even after TCUI metroplasty, patients with unicornuate uterus were still at high risk of preterm delivery. In our study, the preterm delivery rate after TCUI remained high at 27%. Thus, it is important that patients who conceived after TCUI be managed in high-risk obstetrics units with regular monitoring of cervical length.

### Table 3: A comparison of the pregnancy outcome before and after TCUI in twenty women who conceived after TCUI, n

| Pregnancy outcome | Before TCUI | After TCUI | t | P |
|-------------------|-------------|------------|---|---|
| Miscarriage       |             |            |   |   |
| First-trimester miscarriage | 25 | 0 | 4.626 | <0.001 |
| Second-trimester miscarriage   | 0 | 1 | -1.000 | 0.330 |
| Preterm           | 3 | 5 | -0.809 | 0.428 |
| Term              | 0 | 11 | -4.819 | <0.001 |
| Intrauterine death| 1 | 0 | 1.000 | 0.330 |
| Ongoing pregnancy | NA | 1 | NA | NA |
| Live birth        | 3 | 16 | -6.658 | <0.001 |

*There were 11 termination of pregnancies and three ectopic pregnancies before TCUI not included in the table; †There were one termination of pregnancy and one ectopic pregnancy after TCUI not included in the table; ‡Currently, 17 weeks gestation. NA: Not available; TCUI: Transcervical uterine incision.

baby passed away on the 28th day of life due to extreme prematurity. The remaining two cases were delivered at 36 weeks due to premature rupture of membranes. Six out of seven neonates survived.

According to Roddick et al.,[10] cervical incompetence is caused by an abnormal ratio of muscle fibers to connective tissue in the uterine cervix. This is commonly seen in women with congenital uterine anomalies who have a greater proportion of muscle fibers with loss of connective tissue.[31] Moreover, asymmetric downward force exerted by an abnormal uterus, which would be even greater when pregnancy occurs, also plays a role in causing cervical incompetence. TCUI perhaps can correct the above two factors by removing the excessive muscle bulk and restore the symmetry of uterus. In our study, among those who conceived after TCUI, 3 (15%) of them had cervical incompetence, which is somewhat lower than the reported 30% incidence of cervical incompetence in the congenital uterine anomaly. One patient had successful term delivery after transvaginal cerclage at second trimester, one had miscarriage at 20 weeks, the other case had delivered a live birth at 25 weeks, but the baby died on the 28th day of life.

It had been reported that among all uterine anomalies, unicornuate uterus had the highest rate of cervical shortening and the highest rate of spontaneous preterm birth when the cervix is shortened. There is currently no convincing evidence that routine cervical cerclage should be performed in women with Müllerian anomaly. Instead, cervical length should be monitored with serial transvaginal ultrasound examinations, and elective cervical cerclage should be considered for those with cervical length <25 mm.

The presentation and outcome of women with congenital uterine anomalies who have a greater proportion of muscle fibers to connective tissue.[31] Moreover, asymmetric downward force exerted by an abnormal uterus, which would be even greater when pregnancy occurs, also plays a role in causing cervical incompetence. TCUI perhaps can correct the above two factors by removing the excessive muscle bulk and restore the symmetry of uterus. In our study, among those who conceived after TCUI, 3 (15%) of them had cervical incompetence, which is somewhat lower than the reported 30% incidence of cervical incompetence in the congenital uterine anomaly. One patient had successful term delivery after transvaginal cerclage at second trimester, one had miscarriage at 20 weeks, the other case had delivered a live birth at 25 weeks, but the baby died on the 28th day of life.

It had been reported that among all uterine anomalies, unicornuate uterus had the highest rate of cervical shortening and the highest rate of spontaneous preterm birth when the cervix is shortened. There is currently no convincing evidence that routine cervical cerclage should be performed in women with Müllerian anomaly. Instead, cervical length should be monitored with serial transvaginal ultrasound examinations, and elective cervical cerclage should be considered for those with cervical length <25 mm.

Even after TCUI metroplasty, patients with unicornuate uterus were still at high risk of preterm delivery. In our study, the preterm delivery rate after TCUI remained high at 27%. Thus, it is important that patients who conceived after TCUI be managed in high-risk obstetrics units with regular monitoring of cervical length.
10. Golan A, Langer R, Weksler S, Segev E, Niv D, David MP. Cervical cerclage – Its role in the pregnant anomalous uterus. Int J Fertil 1990;35:164-70.

11. Stein AL, March CM. Pregnancy outcome in women with müllerian duct anomalies. J Reprod Med 1990;35:411-4.

12. Ludmir J, Samuels P, Brooks S, Menнутi MT. Pregnancy outcome of patients with uncorrected uterine anomalies managed in a high-risk obstetric setting. Obstet Gynecol 1990;75:906-10. doi: 10.1016/0020-7292(91)90255-4.

13. Moutos DM, Danewood MD, Schaff WD, Rock JA. A comparison of the reproductive outcome between women with a unicornuate uterus and women with a didelphic uterus. Fertil Steril 1992;58:88-93. doi: 10.1016/S0015-0282(16)55141-3.

14. Donderwinkel PF, Dörr JP, Willemsen WN. The unicornuate uterus: Clinical implications. Eur J Obstet Gynecol Reprod Biol 1992;47:135-9. doi: 10.1016/0028-2243(92)90043-X.

15. Acién P. Reproductive performance of women with uterine malformations. Hum Reprod 1993;8:122-6.

16. Heinonen PK. Unicornuate uterus and rudimentary horn. Fertil Steril 1997;68:224-30. doi: 10.1016/S0015-0282(97)81506-3.

17. Raga F, Bauset C, Remohí J, Bonilla-Musoles F, Simón C, Pellicer A. Reproductive impact of congenital Müllerian anomalies. Hum Reprod 1997;12:2277-81. doi: 10.1093/humrep/12.10.2277.

18. Dicker D, Nitke S, Shoenfeld A, Fish B, Meizner I, Ben-Rafael Z. Laparoscopic management of rudimentary horn pregnancy. Hum Reprod 1998;13:2643-4. doi: 10.1093/humrep/13.9.2643.

19. Daskalakis G, Pilalis A, Lykeridou K, Antsaklis A. Rupture of noncommunicating rudimentary uterine horn pregnancy. Obstet Gynecol 2002;100(5 Pt 2):1108-10. doi: 10.1097/00006250-200211001-00021.

20. Airoldi J, Berghella V, Sehdev H, Ludmir J. Transvaginal ultrasonography of the cervix to predict preterm birth in women with uterine anomalies. Obstet Gynecol 2005;106:553-6. doi: 10.1097/01.AOG.0000173987.59595.e2.

21. Akar ME, Bayar D, Vildiz S, Ozel M, Yilmaz Z. Reproductive outcome of women with unicornuate uterus. Aust N Z J Obstet Gynaecol 2005;45:148-50. doi: 10.1111/j.1479-828X.2005.00346.x.

22. Haydardeecdobbgl B, Simsek E, Kildedag EB, Tarim E, Aslan E, Bagis T. A case of unicornuate uterus with ipsilateral ovarian and renal agenesis. Fertil Steril 2006;85:750.e1-4. doi: 10.1016/j.fertnstert.2005.07.1333.

23. McAvey B, Chasan ST. Obstetric outcomes with unicornuate uterus. Am J Obstet Gynecol 2009;201:S58. doi: 10.1016/j.ajog.2009.10.130.

24. Anderson S, Chasan S. Outcomes of pregnancies with incidentally detected unicornuate uterus. Am J Obstet Gynecol 2013;208 1 Suppl: S77. doi: 10.1016/j.ajog.2012.10.320.

25. Watson AJ, Nezam H, Moore A, Hammoud AO. Reproductive outcomes of a large cohort of patients with unicornuate uterus. Fertil Steril 2013;100:5379-80. doi: 10.1016/j.fertnstert.2013.07.745.

26. Heinonen PK, Pystynen PP. Primary infertility and uterine anomalies. Fertil Steril 1983;40:311-6. doi: 10.1016/0001-503X(83)90282-1(6)4729-4.

27. Lekovic J, Anderson S, Niemasik E, Chasan ST. Malperfusion as a possible mechanism of preterm labor in patients with uterine anomalies. Fertil Steril 2013;100:S380. doi: 10.1016/j.fertnstert.2013.07.746.

28. Markham SM, Waterhouse TB. Structural anomalies of the reproductive tract. Curr Opin Obstet Gynecol 1992;4:867-73. doi: 10.1097/00001703-199212000-00015.

29. Xia EL, Peng XB, Ma N, Li YF, Xiao Y, Guo Y. Three cases of unicornuate uterus treated by transcervical incision of uterus metroplasty successfully pregnancy and literature review (in Chinese). Chin J Obstet Gynecol 2013;45:689-91. doi: 10.3760/cma.j.issn.0529-567X.2013.09.013.

30. Blum M. Comparative study of serum CAP activity during pregnancy in malformed and normal uterus. J Perinat Med 1978;6:165-8. doi: 10.1515/jpm.1978.6.3.165.

31. American College of Obstetricians and Gynecologists. ACOG Practice Bulletin No. 142: Cerclage for the management of cervical insufficiency. Obstet Gynecol 2014;123(2 Pt 1):372-9. doi: 10.1097/AOG.0000443276.68274.cc.

32. Pados G, Tsalakidis D, Athanatos D, Almaloglou K, Nikolaidis N, Tarlatzis B. Reproductive and obstetric outcome after laparoscopic excision of functional, non-communicating broadly attached rudimentary horn: A case series. Eur J Obstet Gynecol Reprod Biol 2014;182:33-7. doi: 10.1016/j.ejogrb.2014.08.023.

33. Akdemir A, Ergenoglu AM, Yeniel AO, Sendag F, Karadadas N. Coring-type laparoscopic resection of a cavitated non-communicating rudimentary horn under hysteroscopic assistance. J Obstet Gynaecol Res 2014;40:1950-4. doi: 10.1111/jog.12449.